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ABSTRACT

Because the earth has a limited amount of natural resources which are used by individuals in their everyday living situations, living patterns should reflect the limits and conservation of these resources. This packet (consisting of introductory material, lesson plans, filmography, bibliography, and glossary), provides suggestions for infusing concepts of Reduction, Re-use, and Recycling (the "3RS") into everyday living patterns through classroom instruction. Introductory material consists of a statement of House Joint Statement 66 (1975 Oregon legislation promoting "3RS" in public schools) and discussions of the natural cycle of conservation of matter and energy, common resource use pattern, development of "3RS" concepts, and definitions of and perspectives on reduction, re-use, and recycling. Concept area, grade level, subject area, attitude to be developed in students, instructional strategies, time frame, materials, follow-up questions, resources, and competencies/skills fostered are provided for each of 20 lesson plans. Lesson plans are preceded by a discussion of their format/methodology (traditional classroom method, exploratory/discovery method, and simulation games) and a lesson plan matrix. Title, time length, grade level, source, cost (or rental fee), and annotation are provided for 25 films in the filmography. (Author/RM)

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THREE R'S

AS A GUIDE TO THE BEST USE OF OUR FINITE RESOURCES

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These educational materials have been designed to blend the concepts of 1) Reduction 2) Reuse and 3) Recycling into the school curriculum. The packet was developed by the Environmental Education Association of Oregon to encourage and facilitate implementation of House Joint Resolution 66 (Oregon Legislature - 1975).

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INTRODUCTION

The Earth is a planet, and as such, is finite, with a limited amount of natural resources.

> The concept of FINITE RESOURCES is founded on the "spaceship" view of our planet. Earth, very much like the man-made space craft we have sent to the moon, is provisioned with a set amount of resources basic to life. That leaves human beings with the responsibility of using, re-using, and recycling these finite resources so they will not be depleted, and therefore unavailable for future generations.

Earth's resources are used by people in their every day living situations.

> Modern societies have become very wasteful of materials and energy. Resources flow in a cycle, starting out as concentrated materials such as coal, iron ore, oil, or trees, extracted from the earth. These materials are processed by industry, used by humans, then discarded back into the Earth's system in the form of various kinds of waste (i.e. garbage).

The living patterns of people should reflect knowledge of the limits and the conservation of resources.

> We must first REDUCE the total amount of resources we consume, and then RE-USE and RECYCLE those resources we do use, in order to conserve our limited supply.
>
> This packet is intended to provide initial suggestions for infusing the concepts of REDUCTION, RE-USE, and RECYCLING (the "3RS") into our everyday living pattern, through classroom instruction.
>
> Users are encouraged to adapt, change, adjust and apply these materials to suit classroom and students. Many lessons can easily be revised for different grade levels and situations.
>
> The packet represents only a beginning and the materials hardly scratch the surface.
>
> As you examine the packet you will undoubtedly become aware of a close interrelationship existing between the "3RS". It is this closeness which makes it difficult to examine and teach each concept separately. Therefore, when possible, we encourage the combination of both lesson plans and activities.

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House Joint Resolution 66

Sponsored by Representatives WHITING, BONEBRAKE, CHREST, FADELEY, FERGUSON, GUSTAFSON, GWINN, KAFOURY, KERANS, KULONGOSKI, MARX, McCRAE, MYERS, PECK, STARR, Senators ATIYEH, BURBIDGE, McCOY, B. ROBERTS, THORNE, WINGARD

SUMMARY

The following summary is not prepared by the sponsors of the measure and is not a part of the body thereof subject to consideration by the Legislative Assembly. It is an editor's brief statement of the essential features of the measure as introduced.

Directs that schools teach and practice skills of recycling and resource-energy conservation.

NOTE: Matter in bold face in an amended section is new; matter [*italic and bracketed*] is existing law to be omitted; complete new sections begin with SECTION.

HOUSE JOINT RESOLUTION 66

Whereas the practice of discarding materials used in school facilities is wasteful of natural resources, energy and money; and

Whereas one of the functions of schools is to set an example of good citizenship; and

Whereas the people of the State of Oregon are vitally concerned about and desire to promote waste-material recycling in Oregon; and

Whereas recycling of such waste materials and the use of recycled materials is consistent with legislative policy on resource conservation; now, therefore,

Be It Resolved by the Legislative Assembly of the State of Oregon:

That Oregon public educational institutions should act to make resource conservation an integral part of their physical operations and curriculum. Specifically, the following actions are recommended:

(1) That the planned course statements written to teach the environmental competencies required for high school graduation include those that will enable the student to practice recycling and resource-energy conservation in everyday life at home and at work or school.

(2) That Oregon educational institutions develop systems to eliminate wasteful materials consumption by encouraging such practices as using both sides of a piece of paper for printing and writing and reusing paper which has been printed on one side.

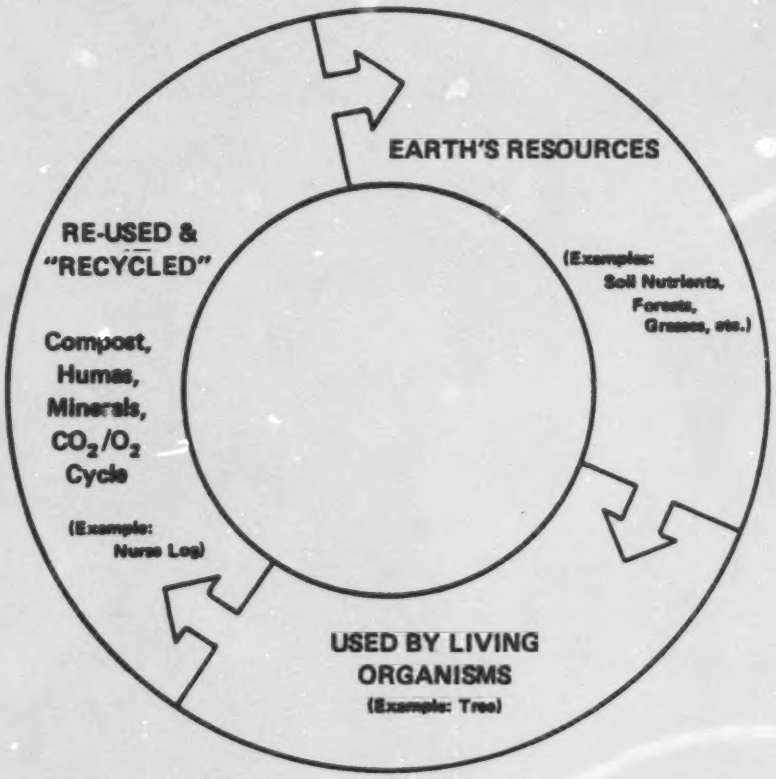
(3) That Oregon educational institutions recover all marketable wastes from their facilities, including but not limited to ledger paper, newspaper, corrugated cardboard, glass containers, tin cans, aluminum and plastic, in all parts of these facilities, including classrooms, kitchens, administrative offices and duplicating centers.

(4) That Oregon educational institutions endeavor to purchase for use in their facilities recycled products of all kinds, most especially recycled paper and paper products.

NATURAL CYCLE OF CONSERVATION OF MATTER AND ENERGY

The change of natural resources for all practical purposes is limited to the Earth. Therefore we can represent these changes as a cycle where materials are removed from the Earth, processed to meet human needs, used, and then discarded.

Mother Nature has been "recycling" her resources on this planet for millions of years, constantly changing the form of things, but using and re-using materials in never ending cycles.



As Humans:

We must seek to bring our resource use patterns back within natural cycles which conserve and re-use all matter, thus balancing our roles on planet Earth.

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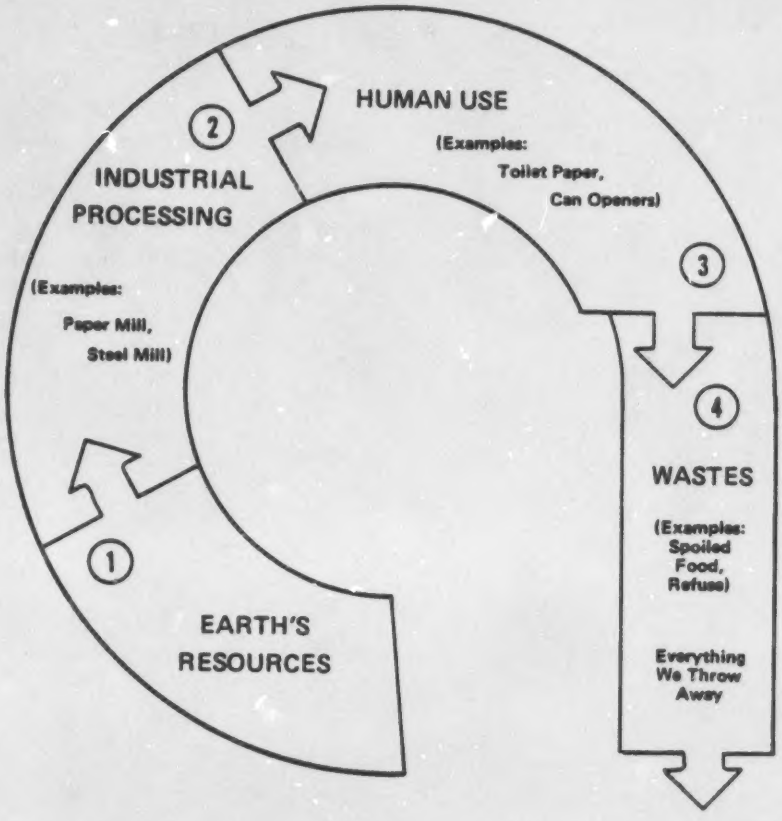
COMMON RESOURCE USE PATTERN

Historically, society has encouraged the production of wastes that cannot be re-used in the resource cycle, commonly referred to as exploitation.



1. The cycle begins with natural resources being extracted or harvested from the Earth (e.g. minerals, gravel, oil, iron, trees).

2. Resources are then made into products by industrial processes (trees into lumber and paper, iron ore into steel and can openers, oil into gasoline and plastics, etc.)

3. People use these products in meeting their everyday needs and the list is countless.

4. Without a conscious effort to include reduction, re-use and recycling into everyday living, resources become leftovers and then are wasted...ultimately going from the garbage can to the dump.

The limits to this resource-use pattern are reached when the supply of resources has become depleted and the ecosystem is thrown out of balance.

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DEVELOPMENT OF "3-R" CONCEPTS

The concepts dealt with in this packet are interrelated and interdisciplinary in nature.

The goal of the following CONCEPT DEVELOPMENT outlines is to demonstrate that each concept has its own integrity, and to suggest a process by which each may be infused into present elementary and secondary disciplines.

Further, these outlines point to a developmental process rooted in an early introduction to the concepts.

Ideally, lower elementary grade youngsters can learn to express and understand the basic meanings of each concept. As the student advances, the concepts become more complex and develop their interdisciplinary depth.

Note that the diagrams have been simplified and somewhat exaggerated to facilitate quick analysis and use of the materials. Any detailed discussion would turn up many more examples and approaches.

Finally, keep in mind, that the concepts are aimed at students and/or the uninformed. Therefore, the level of complexity has been purposely kept low.

These outlines are only a beginning and are intended for use as a limited resource.

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REDUCTION, WHAT IT MEANS

DEFINITION: The process of using less material and energy by the following methods.

1. Using less material per product and less energy to produce that product.
2. Producing re-usable, durable products, and ones which contain only re-usable/recyclable materials.
3. Producing a smaller total quantity of products.
4. Buying and consuming a smaller quantity of products.
5. Sharing equipment and materials (books, car pools, etc.).

In discussing the problems of wasted resources, it becomes clear that cutting down on waste is inevitable. The primary means of doing this is reducing the use of resources and energy at the beginning of the use cycle...i.e. at the source of the waste. This is referred to as SOURCE REDUCTION (hereafter called REDUCTION).

REDUCTION is the underlying principle upon which Re-use and Recycling systems are based. Through REDUCTION, Earth's resources are used prudently, re-usable products are created and less waste is generated.

REDUCTION begins with education at home and in schools. In the broader sense this education includes:

encouragement of industry to develop lasting re-usable products, thus reducing consumption of resources at the source. It also implies a more conscientious involvement on the part of consumers by encouraging them to buy quality products, to be re-used, and avoiding those destined to become waste. It further encourages the re-use and/or return of products and the further reduction of waste by recycling.

More Perspectives on Reduction:

Reducing the amount of resources used can be done in many ways, often limited only by imagination.
Need varies considerably when using resources.
Some resource uses are more wasteful than others.
Running out of resources is a real possibility if Reduction is not practiced.
Personal habits and values have much to do with social norms for resource use.
Politics, economics, and social norms play important roles in determining resource-use practices.
Resources represent power, power struggle and vested interest.
Strong economies are dependent on plentiful resources.

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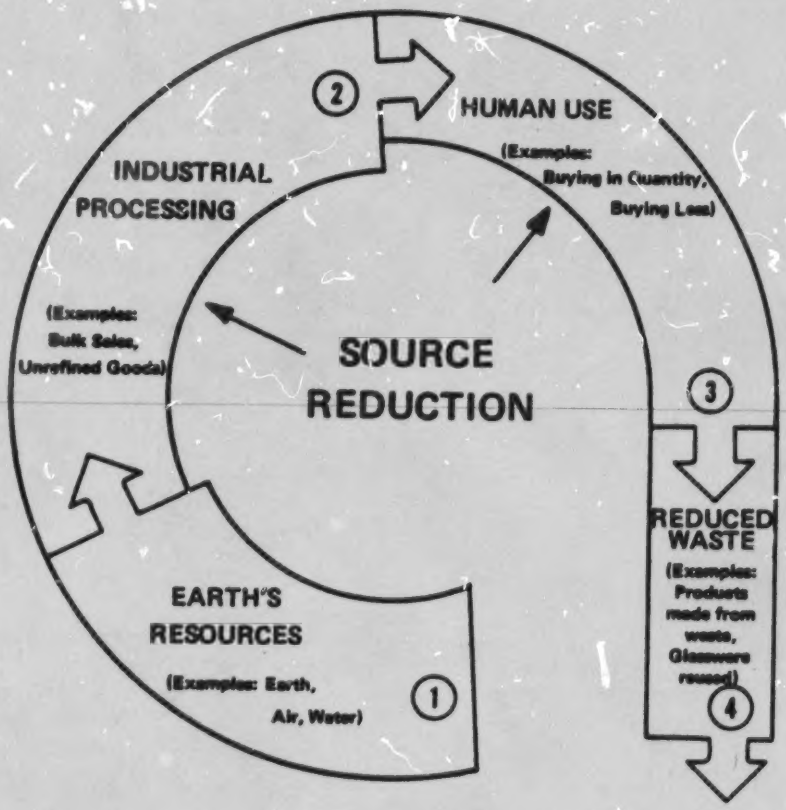
REDUCTION, WHAT IT MEANS



The following observations can be made in examining the Reduction diagram:

1. Reduce use of resources by increasing efficiency in extraction process and avoiding needless destruction and waste (Ex. ercsion, high-grading).

2. Reduce use of resources by conservation in manufacturing processes and products (Ex. packaging, additives).

3. Reduce use of resources by conscientious buying and consuming habits (Ex. avoiding excessively wrapped goods, buying in season).

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4. Reduce use of resources by removing manufactured goods from the waste stream and recycling or reusing them (Ex. glass bottles, aluminum, canning jars).

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RE-USE, A NEXT STEP

DEFINITION: The multiple use or continued circulation of a product in its original form without altering the original form of the item. This can happen by a number of ways.

The first step beyond reducing the total amount of materials "consumed" is to re-use products so they do not end up as waste. (Examples: refillable bottles returned for refilling, jars re-used for canning and freezing, grocery sacks returned and refilled with groceries, aluminum foil washed and re-used over and over again, sharing magazines, etc.)

RE-USE begins with product design at the industrial level...e.g. bottles designed to be refilled. (Example; mayonnaise jars, wine bottles).

In using products, people need to become aware of the products that are re-usable, how they can be re-used, and the values to be gained in re-using them. In many cases, values may need to be adjusted to bring about this awareness.

RE-USE is also finding alternative uses for objects other than what they were originally designed for...e.g. cardboard box toys, etc.

The Oregon Bottle Bill is an excellent example of a statewide effort to re-use containers, reduce waste, curb litter and reduce demands on natural resources.

More Perspective on Re-Use

Re-use is one method of extending the life of resources.

Many non-replacable resources can be re-used.

Re-use habits can be superimposed on existing single use habits.

Society's value structure comes into play in Re-Use.

Advertising has a great impact on the re-usability of products.

Short-range gains in affluence through the single-use of resources will not pay off in the long-range.

The re-use level of resources is directly related to the perceived availability of "raw" natural resources.

Legislative directives help to establish the level of re-use in a given situation.

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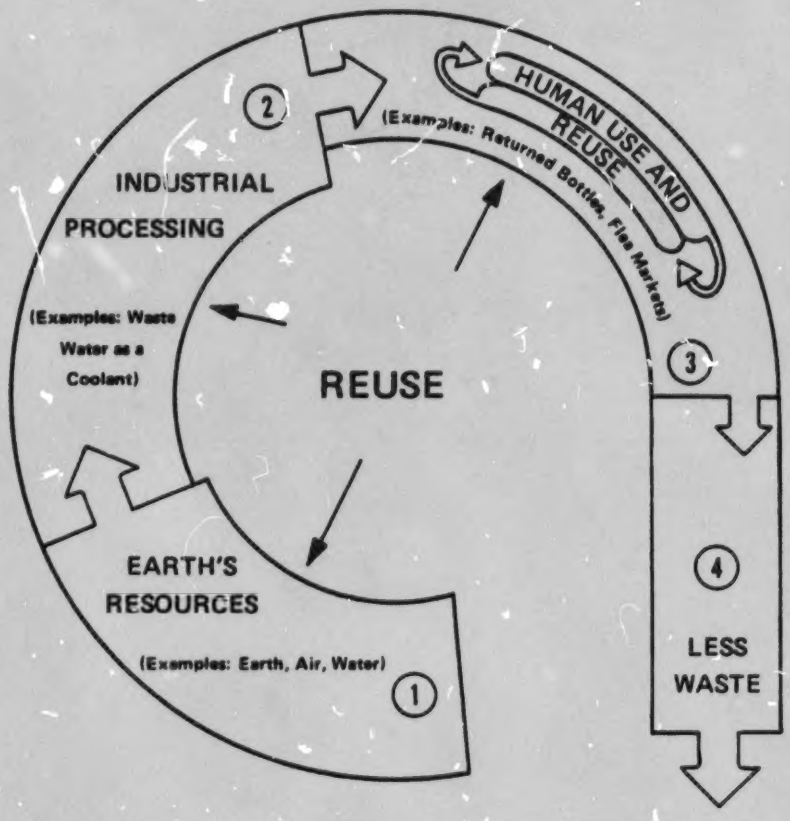
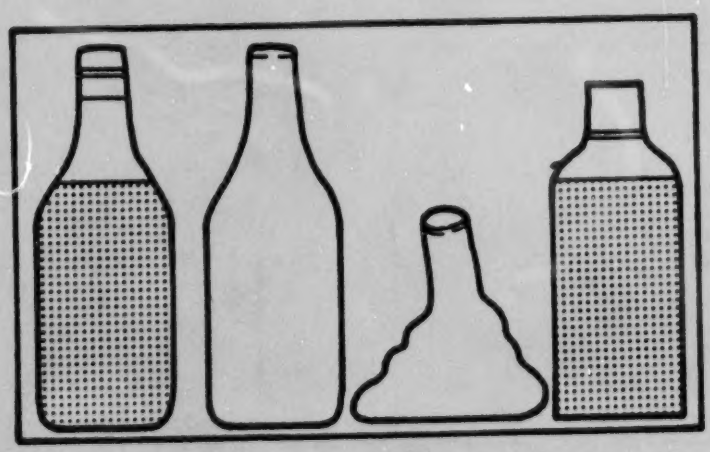
RE-USE, A NEXT STEP



1. Raw materials used over again (Ex. fill dirt, leaves for mulch).
2. Processes designed to allow re-use of resources at the industrial level.
3. Products used and re-used by conscientious consumers.
4. Waste converted into fertilizer, etc.



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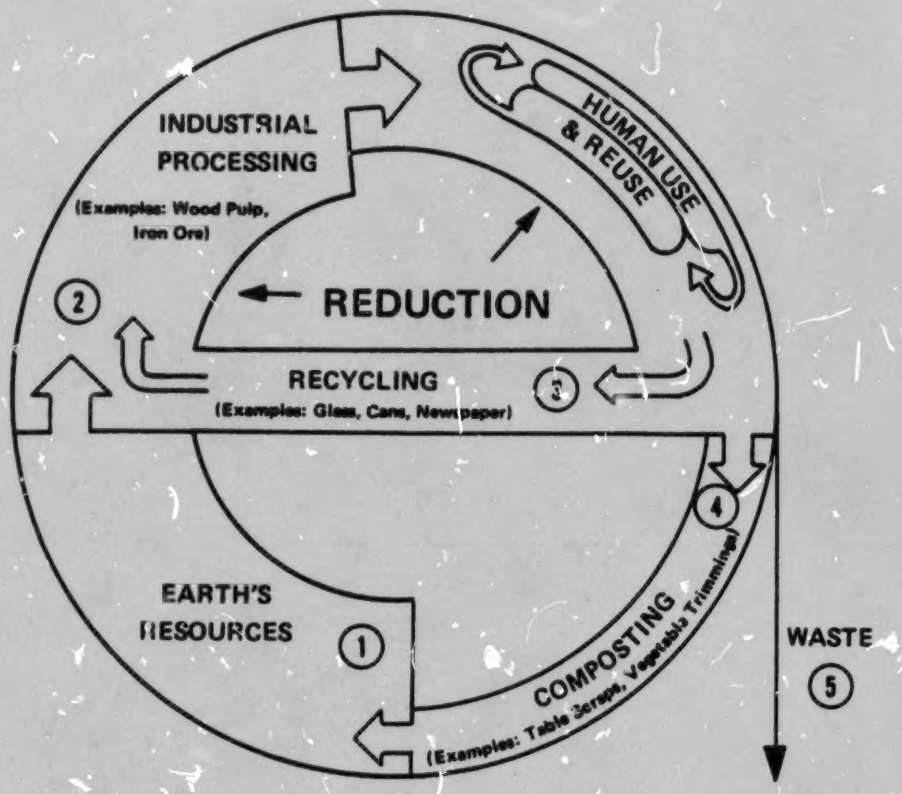
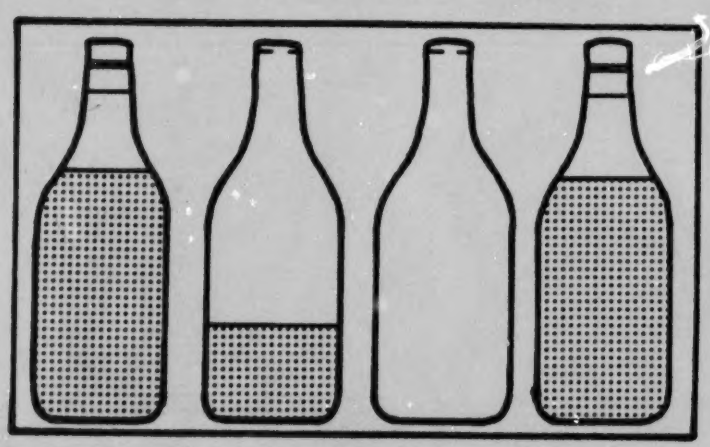
RECYCLING, A LOGICAL OUTGROWTH



1. Nature recycles resources endlessly.
2. Recycled raw materials are used in industrial processes to conserve virgin Earth resources.
3. Materials are recovered and recycled by conscientious consumers.
4. Organics are recycled through composting.
5. Waste is reduced to a minimum.



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RECYCLING, A LOGICAL OUTGROWTH

DEFINITION: The recovery and return of a material back into the process by which it was first formed, or into alternative processes for product manufacturing or energy production.

The next step beyond re-using materials is recycling them, thus recovering resources to be used again as substitutes for raw materials of industry. (Examples: crush glass back into glass-making, aluminum cans back into new aluminum, newspapers back into newsprint, etc.)

RECYCLING begins when a product has reached the end of its original usefulness. (i.e. bottles, cans, newspapers, etc.)

Recyclable materials are collected, sorted, and transported to buyers of raw materials and then used in the industrial process.

RECYCLING is not achieved until the material is actually used as a substitute for material in making a product.

Composting of organic wastes completes the cycle of recycling the Earth's resources back for re-use.

An effective recycling program will reduce the amount of virgin resources used by industry and people, thus reducing the demand on the finite supply of those resources.

More Perspectives on Recycling

Less Complex

Recycling is like a wheel that keeps rolling or an endless circle. There are practical ways to recycle now.
Recycling is a positive alternative to "throwing things away," because there is no "away."
Virgin materials have to be replaced by recycled materials, as they are depleted.

Somewhat Complex

Recycling habit development is hampered by short-range economic gain possibilities. Consumers need to think in long-range terms.
Recycled materials effectively replace raw materials in many cases.
Recycling has several components, among them material and energy recovery.
Recycling is a thrift-oriented concept.

More Complex

The public concept of "waste" as dirty, is a block to serious consideration of recycling development.
Recycling efforts are often considered by industry as practical only when they prove to be a money-maker.
Recycling of materials for their resource and energy values is becoming more and more necessary as shortages and costs of virgin resources increase.

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LESSON PLAN FORMATS AND METHODOLOGY

The variety of lesson plan formats contained in this packet are intended to serve teachers as starting points in their utilization of the activities suggested. Some of them are variations of the same activity, allowing for choices in approach.

The plans have been collected from a number of sources - most directly from teachers who have refined them through use in the classroom, and some from curriculum guides developed for other concepts.

Several methods are suggested in the various lesson plans. These can be grouped into three general categories:

1. Traditional Classroom method: This approach can be used with many of the lessons. All activities are generally done in the classroom, with the teacher serving as initiator, and guide.

2. Exploratory/Discovery method: For this procedure, questions and/or conflicts are presented to the students, and they are expected to solve these questions with the help of the teacher, who serves as a resource. One variation of this method is a problem-solving form submitted by a 6th grade teacher who effectively uses it in her own classroom. A sample is printed below. This method often requires out-of-classroom activities.

3. Simulation Games: A method of presenting a problem, such as recycling, in game form in which students and teacher become participating members. In this situation, the teacher serves as arbitrator and may actually take part in the simulation.

While it is recognized that including more background materials with this packet would be most welcome and useful, we have found it unwieldly to do so. We hope that the various references listed throughout will give teachers enough help to locate needed in-depth information.

In using these lesson plans, teachers are urged to adjust, modify and expand to suit individual needs. In doing this, we hope that they will retain the basic framework of the 3 R's concepts.

Of special interest is the U.S. Forest Service "Quicky-Way" investigation approach. Contact them for additional information.

SAMPLE PROBLEM-SOLVING FORMAT

Identify the problem _____

Why are you concerned? (values)_____

Alternate Actions	Where to Go for More Information	Possible Results of Each Alternative	
		Good	Bad

What is your choice?

Reason for your choice?

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LESSON PLAN MATRIX

PLAN NUMBER	UNDERSTANDING OR ATTITUDE	REDUCTION			REUSE			RECYCLING		
		GRADE LEVEL	SUGGESTED SUBJECT AREA	PAGE NO	GRADE LEVEL	SUBJECT MATTER AREA	PAGE NO	GRADE LEVEL	SUBJECT MATTER AREA	PAGE NO
1	Reusing waste paper in the classroom				K-6	General	20			
2	Reducing and re-using "trash"	4-6	Citizenship	22	4-6	Mathematics	22			
3	Reducing paper use in the classroom	4-6	Math	25						
4	Saving resources by picking up litter	4-6	Citizenship	27						
5	Excessive Packaging is a waste of resources	4-6	General	29						
6	Most discards can be reused or recycled							4-6	General	30
7	Households are a major source of waste	7-9	Math, Science, Home Economics	32						
8	Individuals are responsible for reducing household waste	7-12	Math, Science, Home Economics	35						
9	Various kinds of waste can be handled different ways				7-9	Social Studies	37	7-9	Social Studies	37
10	Reuse has a specific life style				7-9	Science, Home Ec., Social Studies	39			

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LESSON PLAN MATRIX

PLAN NUMBER	UNDERSTANDING OR ATTITUDE	REDUCTION			REUSE			RECYCLING		
		GRADE LEVEL	SUGGESTED SUBJECT AREA	PAGE NO	GRADE LEVEL	SUBJECT MATTER AREA	PAGE NO	GRADE LEVEL	SUBJECT MATTER AREA	PAGE NO
11	Recycling conserves and can generate income							7-12	Science, Math, Social Studies	40
12	Reusable containers are energy efficient				9-12	Art, Home Economics	42			
13	Reduced packaging impacts energy consumption, raw materials & solid waste	9-12	Home Ec., Social Studies	43						
14	Excessive packaging involves economic & environmental trade-offs	10-12	Social Studies, Home Economics	48						
15	Lifestyles determine consumption	8-12	Environ. Ed., Soc. Studies, Science	50						
16	School lunch programs generate solid waste	10-12	Math, Science, Environmental Ed.	52						
17	Composting recycles organic matter							7-12	Science, Indust Arts, Envir. Ed	54
18	Lit. can reflect the conservation & misuse of resources	10-12	Lang. Arts	57	10-12	Lang. Arts	57		Lang. Arts	57
19	Human behavior cause envir. problems	10-12	Lang. Arts	59	10-12	Lang. Arts	59	10-12	Lang. Arts	59
20	Economic potentials exist in recycling							10-12	Social Studies, Science, Math	61

CONCEPT: RE-USE PLAN #1

GRADE LEVEL: K-6 SUBJECT AREAS: General

PROBLEM:
Waste takes away resources we may need in the future.

ATTITUDE TO BE DEVELOPED IN STUDENTS:
I should re-use paper so less is wasted.

PROCESS:
1. Collect paper discarded by your students for two or three days.

2. Get two pasteboard boxes and title one, "Paper we can use again". Title the other box, "Paper we can't use again."

3. As a class project divide the collected discarded paper into the two categories.

4. Discuss what to do with "paper we can still use" (eg. scratch pads, drawing paper, quiz sheets, etc.)

5. Discuss with the students where paper comes from. (For example, illustrate on the chalkboard: trees-log-truck transportation-pulp mill-truck transportation-wholesale warehouse-truck transportation-store-you.)

6. Discuss what happens to paper when thrown away. (Illustrate as in #5...collected by custodian, to trash box, to garbage truck and landfill, or to incinerator, or to recycling center.) Use simple computation appropriate to grade level to calculate amount of paper collected.

7. Discuss what happens to paper when it is reclaimed.

TIME FRAME: Open

MATERIALS: Collected discarded paper-two pasteboard boxes with signs

FOLLOW-UP QUESTIONS:
1. Are there still some uses for the paper in the box titled "Paper we can't use again" (e.g. cut and paste art, fuel, etc.)?

2. Can this paper be re-made back into new paper...recycled? Should our class recycle?

3. What would happen if the whole class...or the whole student body... used two sides of paper instead of one, or used ½ sheet for short assignments? Could this reduce the amount of trees that need to be cut?

4. Can waste from classrooms or homes be reduced through re-use?

5. Should our class continue separating paper for re-use?

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Plan #1 Continued

RESOURCES:

"The Paper Paper," and "Paper Recycling Fact Sheet" Recycling Information Office, Department of Environmental Quality, 1234 S.W. Morrison, Portland, Oregon 97205, Local paper resource industry (forest, papermill, paper recycling industry) for information or tours.

COMPETENCIES/SKILLS:

1. Explain why one should not waste paper.
2. Tell how you can waste less paper in the classroom.
3. Recognize paper which is no longer reusable.

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CONCEPT: REDUCTION, RE-USE PLAN #2

GRADE LEVEL: 4-6 SUBJECT AREAS: Citizenship, Math

PROBLEM:
We buy many things that we use just once or twice then throw away as trash; this "trash" contains resources we will need in the future.

ATTITUDE TO BE DEVELOPED IN STUDENTS:
I should reduce my own demand for resources by making some things I need out of trash.

PROCESS:
1. Discuss the fact that we throw many things away every day. Make a list on the board.

2. Ask your students to bring two or three objects from home or lunchroom, which they normally would throw away (e.g. tin can, milk carton, straw, disposable plates, utensils, trays, etc.). Limit what they bring to clean, inorganic items.

3. Next day talk about all the things your students brought. Make a chart on the board with three columns, titled ITEM, USE, and SECOND USE.

4. Record the information about each object in each column.

5. Elicit imaginative "second uses." These alternative uses could lead to reduction in our demands for natural resources (e.g. by using a tin can or string and a tack in drawing a circle we choose not to buy a compass or by using milk cartons for seed starters we choose not to buy pots.)

6. Ask your students to share their own samples--or stories of useful items they've made from trash.

TIME FRAME: 60 minutes distributed over 2 or 3 days

MATERIALS: Miscellaneous waste objects

FOLLOW-UP QUESTIONS:
1. What resources were used to make these objects? Are these resources found around here?

2. Can you classify the natural resources in the waste objects into plant or mineral and determine which resource you use the most of?

3. What resources travel the longest distance to get to you?

4. Does the traveling use up resources? Which resources?

5. Discuss whether use of refillable containers and permanent dishes could reduce the number of things now thrown out.

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Plan #2 Continued

RESOURCES/REFERENCES:

Basic physical geography text and atlas - see natural resources. Pamphlets are available from U.S. EPA, 1220 S. W. Morrison, Room 310, Portland, Oregon 97205.

COMPETENCIES/SKILLS:

Pretend you made a pencil container by covering a tin can with material left over from a shirt your mother made. Explain why less new resources had to be taken from the earth because you made - not bought - this pencil holder. Explain how imagination is essential in finding a second use for trash.

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OPTIONAL VARIATIONS OF ACTIVITIES FOR PLANS #1 and #2

1. Divide the class into groups and give each group some of the "paper we can still use," pencils and one of these articles: grocery bag, magazine, gift-wrap paper, Christmas cards, newspaper, lunch sack, milk carton.

   Ask each group to list on the paper all the ways they can think of to re-use the item. After 10 minutes, share the ideas.

2. Repeat this exercise with ditto paper and other items used in the classroom, such as pencils and crayons.

3. Act on the above suggestions during subsequent class activities.

4. Maintain a room recycling center (at Christmas time you might call it "Santa's Recycling Workshop"). Make gifts, models, table decorations, collages, bookmarks, name tags and anything else students can suggest out of recycled products from school and from home.

5. Give each student a 12 inch by 12 inch piece of masonite painted with slate to use instead of paper for practicing writing and drawing skills.

6. Instead of using construction paper to teach color awareness, use colors cut from magazine pictures.

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CONCEPT: REDUCTION PLAN #3

GRADE LEVEL: 4-6 SUBJECT AREAS: Math

PROBLEM:
How much paper is used in your classroom and can you help reduce this usage?

ATTITUDE TO BE DEVELOPED IN STUDENTS:
Paper usage can be reduced in the classroom.

PROCESS:
1. Each student should weigh all the paper in their desk, books and all.
2. Add all the totals and come up with a classroom total.
3. Use long division to determine the average weight of paper for each student.
4. Use multiplication to calculate the approximate total weight of paper used by all students in the building.
5. Calculate the percentage (%) of the class total that the paper in your desk represents.
6. Calculate an estimated total weight for paper in each of the other classrooms. Ask each of the other classrooms to determine the actual weight of paper in its room and compare with your estimated guess.
7. Calculate the percentage of paper weight contributed by each class to the total weight in the school building.
8. After all these figures are determined, discuss ways of reducing paper usage in your class. (For example, using both sides of the paper, saving paper used on one side for scratch pads or quiz sheets, etc.)
9. Put into effect as many of the paper-saving suggestions as you can for a pre-determined amount of time...(i.e. one week, one month, etc.)
10. After the time period, repeat the parts of the process which measures total paper usage in your classroom and compare figures. Has the paper usage been reduced?

MATERIALS: Small scale (calibrated in metric scale)

TIME FRAME: One week or longer

FOLLOW-UP QUESTIONS:
1. Should our class continue to use paper-saving ways to reduce the total amount of paper used by the class?

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Plan #3 Continued:

2. What would happen if the whole school used both sides of the paper instead of one? Would this reduce the number of trees that need to be cut?

3. Can the class further reduce the amount of paper thrown away by recycling?

RESOURCES/REFERENCES:

"Paper Recycling Fact Sheet," RIO, Department of Environmental Quality, 1234 S. W. Morrison, Portland, Oregon 97205.

COMPETENCIES/SKILLS:

1. Demonstrate how paper usage in the classroom can be reduced.

2. Recognize that schools are heavy paper users.

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CONCEPT: REDUCTION PLAN #4

GRADE LEVEL: 4-6 SUBJECT AREAS: Citizenship

PROBLEMS:
Schoolground litter is unsightly, affects everyone and is wasteful of resources we will need in the future.

ATTITUDE TO BE DEVELOPED IN STUDENTS:
I should help reduce the amount of resources that becomes litter on the schoolground.

PROCESS:
1. As a group, guess the amount of litter you could collect on the grounds. What size bag would it fill?

2. Give each team of two to four students a larger paper grocery sack. Tell them they have five minutes to pick up all the litter they can find on the schoolground. You may wish to make this a competitive game.

3. Back in the classroom, determine categories for the litter and divide the collection into different piles.

4. Determine through discussion who discards the materials on the schoolground and why. (Deliberate? Thoughtless? Careless? Accidental?)

5. As group identify strategies to reduce litter on the schoolground (posters, litter barrels, puppet shows, etc.).

TIME FRAME: Open

MATERIALS: Two pasteboard boxes. Litter bags.

FOLLOW-UP QUESTIONS:
1. What categories had the most pieces of litter? How much of this litter came from packaging...i.e. the container for the product consumed?

2. If you purchased materials with a minimum of packaging, would that reduce the litter problem? Why or why not? Name some items you should or should not buy because of their type of packaging.

3. Can you monitor a section of the schoolground to prove your actions are having an effect on littering there?

4. Consider the impact of littering on the entire school district, the city, county and state. (Again, math calculations could be used here.)

5. What don't you throw away? Why? Do you value it? Are you harmed by throwing it away?

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Plan #4 Continued

6. What is SOLV? Is litter like vandalism?

7. How does litter affect your surroundings and your feeling toward your environment?

8. Try filling up a litter bulletin board or earning privileges by picking up pieces of litter during recesses.

RESOURCES:

Stop Oregon Litter and Vandalism (SOLV), 824 S.W. 5th, Portland, Oregon 97204. Pamphlets.

COMPETENCIES/SKILLS:

1. Tell why and how you intend to reduce litter on your schoolground.

2. Explain what effect your reduction might have on you and your friends.

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CONCEPT: REDUCTION PLAN #5

GRADE LEVEL: 4-6 SUBJECT AREAS: General

PROBLEM:
We like to buy things in convenient throw-away packages, but the packages have been made from resources we will need in the future.

ATTITUDE TO BE DEVELOPED IN STUDENTS:
I should reduce my own demand for resources by buying only those items which have little or no packaging.

PROCESS:
1. Purchase a large package of chewing gum and pass out a stick of gum to each student.

2. Ask your students to carefully unwrap the gum without tearing the wrappers.

3. Glue the wrappers in a pattern on a piece of poster or pasteboard. Emphasize the amount of material that was used just to package the gum.

4. Discuss the source of raw materials to manufacture the packaging material and summarize the environmental impact of resource extraction (mining, logging, etc.).

5. Brainstorm items or places that have or use excessive packaging.

6. Brainstorm individual actions one might take to reduce the waste of excessive packaging.

7. Try out some actions identified in step #6.

TIME FRAME: Two to three days

MATERIALS: One large pack of gum, one piece of pasteboard

FOLLOW-UP QUESTIONS:
1. What kinds of products commonly use excessive packaging?

2. Consider the impact on environment and energy.

3. What kinds of excess packaging might be considered necessary?

4. What things can students do to reduce packaging?

RESOURCES:
D.E.Q. Fact Sheet on Packaging, Dept of Environmental Quality, 1234 S.W. Morrison, Portland Oregon 97205.

COMPETENCIES/SKILLS:
1. Recognize that excess packaging is often done for convenience.

2. Identify ways consumers (even students) can avoid over-packaged products.

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CONCEPT: RECYCLING PLAN #6

GRADE LEVEL: 4-6 SUBJECT AREAS: General

PROBLEM:
We waste natural resources by discarding many things which contain materials that can be recycled.

ATTITUDE TO BE DEVELOPED IN STUDENTS:
Most materials we use ("consume") can be used again, either as is or as a substitute for raw materials for producing products again. We ought to re-use and recycle discards to conserve energy and resources.

PROCESS:

1. Make a list of things thrown away at school and at home. (i.e. bottles and jars, plastic containers, tin cans, milk cartons, TV trays, newspapers, notebook paper, food scraps, junk mail, etc.)

2. Identify categories of materials such as these: glass, plastic aluminum, metals, cardboard, organic matter, paper etc. Make a chart using these categories as headings and listing the items in #1 under the appropriate heading.

3. Discuss recycling: what it is and how and why recycling materials at school or at home will cut down on the garbage that is thrown away and save resources and energy.

4. Obtain information about what materials can be recycled and which are now being recycled in your local area. Learn how these materials must be prepared and/or separated. Use any or all of the following means to obtain this information:
   a) use printed and film source materials listed below.
   b) locate nearest recycling center and visit it.
   c) invite someone from a recycling center to speak to the class and demonstrate how to prepare materials.
   d) invite someone to discuss methods for composting, as a means of recycling organic matter.

5. Set up a "mini-recycling center" in the classroom, with labeled boxes for each different material to be recycled. (The types of materials should be determined by what can be recycled in your local area.) Examples might be: glass, cans, aluminum, newspapers, high grade paper, cardboard, brown sacks, etc.

6. Select a Recycling Manager and a number of recycling volunteers from the class.

7. Have students bring recyclable items gathered from home, school and their classroom, insisting that each be prepared correctly according to what they learned in #4. The Manager and volunteers should check the materials brought in and place each in the labeled box for that material.

8. When boxes are full, arrange to transport the materials to the local recycling center.

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Plan #6 Continued

TIME FRAME: Minimum - 1-2 weeks, longer if project is on-going.

MATERIALS: Discarded items from home and school, prepared for recycling. Boxes and containers for gathering materials. Possible transportation.

FOLLOW-UP QUESTIONS:

1. Observe the "mini-center" while in operation: Do some of the boxes fill up faster? Are some materials heavier? Bulkier? Can the class design a center with appropriate size containers for each material, so that all the boxes/containers fill up about the same time for transporting?

2. Should the class recycle in the classroom on a regular basis? Can class members serve as resource people for the rest of the school, to encourage recycling on a school-wide basis?

3. Can the class encourage recycling in their own neighborhoods by creating and distributing information about how to recycle and where the nearest recycling center is?

4. Discuss why recycling of organic wastes should be included in consideration of materials to be recycled...i.e. recovering plant and animal wastes for composting and returning to the soil saves nutrients and energy which are otherwise lost to rivers and lakes where they become pollutants.

RESOURCES/REFERENCES:

"Recycling Fact Sheets", "How to Recycle: A Guide to Saving and Sorting" and "Guidelines for Recycling Wastes in Schools" all three available from Recycling Information Office, Oregon Dept. of Environmental Quality, 1234 S.W. Morrison, Portland OR 97205. Local Recycling Center (DEQ's Recycling Switchboard can help - 229-5555).

FILMS:

"Lets Help Recycle," 11 min., Oregon Division of Continuing Education Film Library, 1633 S.W. Park Ave., Portland, Oregon 97207.

"Recycling Our Resources," 11 min., Oxford Films, 1136 N. Las Palmas AV., L.A., CA 90038...also available at the Multnomah County I.E.D. for teachers in that system.

"Recycling in Action," 14 min., 1973, Film Fair Comm., 10900 Ventura Blvd., Studio City, CA 91604.

"Recycling" 1976, BFA Education Media, 2211 Michigan Ave., Santa Monica, California 90404.

COMPETENCIES/SKILLS:

1. Tell what recycling is and why we should recycle materials we use.

2. Identify specific examples of school and household wastes that can be recycled.

3. Demonstrate methods of preparing wastes for recycling.

4. Recognize the energy reduction resulting from recycling.

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CONCEPT: REDUCTION PLAN #7

GRADE LEVEL: 7-9 SUBJECT AREAS: Math, Science, Home Economics

PROBLEM:
How much solid waste does a household produce each day? What realistic techniques can be used to reduce this amount?

ATTITUDE TO BE DEVELOPED IN STUDENTS:
That one major source of waste production is each person's household.

PROCESS:
1. Discuss with class what type of solid waste you want them to consider. Suggestions: paper, plastic, cans, glass, food (optional - count by volume).

2. For one week have them record the amount of each item discarded at home by filling in the chart on the following page.

3. Have them add the totals of each type to discover the amount of waste generated at home each week. Have them multiply amount/ week by 52 to get an amount used/year.

4. Have students compare their lists with others in class and with one you keep as well.

5. Discuss with students the various kinds of waste, how and why they enter the household, how and why they could be reduced.

TIME FRAME: Minimum of one week (foolow-up discussion would take one day).

MATERIALS: Chart on following page. Resource booklet on solid waste in household from Environmental Protection Agency. Science text with unit on solid waste (optional).

FOLLOW-UP QUESTIONS:
1. How does volume of home waste compare with waste from other sources?

2. What differences exist in waste from urban homes and rural homes?

3. What effect do packaging, reusable containers and redemption have on volume?

GENERAL COMMENTS:
The important part of this lesson is developing self-awareness in students, regarding the waste in their home. Obviously, this could lead into extended instruction on living and eating habits, environmental politics, and the role of technology in the environment.

RESOURCES/REFERENCES:
"Cleaning our Environment, A Basis for Action," American Chemical Society, 1969, (includes accurate facts and figures).

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"Man Against His Environment," R.L.T. Bienow, Ballantine Books, 1970.
"Use It, Use It Up," (film) 26 min., color, $23.00 rental from University of California Extension Media Center, Berkeley, California 94720.

COMPETENCIES/SKILLS:

1. Identify types of residential solid waste and name examples.
2. Measure solid waste in their own home.
3. Identify sources of waste produced in households.
4. Identify ways of reducing household waste.

Note: This lesson plan has also been developed in an alterante format which follows the trash table.

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THIS TABLE CAN BE USED WITH LESSONS #7, #8, #9

TRASH TABLE

	Scrap Paper	Newspaper	Glass	Cans	Plastic	(Optional) Food	Other
Ex. Monday	4 letters 3 cereal boxes 2 egg cartons 1 box frozen peas	2	1 apple juice bottle 1 mustard jar	1 tomato can 1 cat food can 1 corn can	1 wrapper from 1 lb. hamburger 1 detergent bottle	1 quart of various kinds	1 ball point pen
Tuesday							
Wednesday							
Thursday							
Friday							
Saturday							
Sunday							
Total							

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CONCEPT: REUSE/REDUCTION PLAN #8

GRADE LEVEL: 7-12 SUBJECT AREAS: Math, Science, Home Economics

PROBLEM:
Individuals are responsible for unnecessary waste.

ATTITUDE TO BE DEVELOPED IN STUDENTS:
I should become more aware of the generation of waste in the home, and develop a sense of individual responsibility about it.

PROCESS:

1. For one week have students record, using the Trash Table, the amount of garbage discarded in their homes. Describe the types of waste you want them to measure, including scrap paper, newspaper, plastic, cans, glass and food waste. (Food may be optional, if it will create a difficulty.) Ask students to list items under each category and suggest measuring food waste by volume. Have them add the totals of each type to discover the amounts generated each week and multiply by 52 to get the amount per year. Continue computations per each student in class, school, community, etc. Have students compare lists. The easiest way for the student to accomplish this is to ask the family to have a separate sack or container for each category of garbage being measured (this is the source separation concept). Ask: Where does material come from, how does it get to consumer? What happens to energy use and waste volume?

2. The teacher should bring and ask students to bring to class examples of both conservative and wasteful packaging, e.g. individually wrapped portions, large economy size vs. small containers, glass vs. plastic, returnables vs. non-returnables, aerosol containers. Describe local opportunities to buy in bulk. Discuss factors of price, nutrition, energy consumption.

3. Based on what items students recorded were thrown away, discuss how some items could have been avoided or reduced, e.g. individually wrapped portions, ready-to-eat foods, cloth napkins vs. paper, diapers, rags, towels, plates, cups, buying returnable containers where possible, glass milk bottles, refillable pens, lighters, sharing magazines and newspapers.

4. With regard to durable goods such as furniture, appliances, etc., discuss desirability of longevity, repairability, fixing things instead of buying new, even if the cost is comparable, standardized parts.

5. Have students talk with their parents, grandparents, or any older people about the "way it was" before plastic, aluminum foil, disposables. How did we do things in the past? Why did we stop doing things that way?

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TIME FRAME: Ideally, one week for collection and three days for discussion and calculations.

MATERIALS: Chart. Environmental Protection Agency resource booklet on solid waste in household. Science text with unit on solid waste (not required).

FOLLOW-UP QUESTIONS:

1. What action would be necessary to effect change or approach the ideal?

2. What trade offs are involved?

3. How can a student/youth influence an entire household?

RESOURCES:

Use those listed in Lesson Plan #7. Ex.- "Cleaning Our Environment." Also refer to "Food-Energy and Use," Environmental Protection Agency.

COMPETENCIES/SKILLS:

1. Identify sources and volumes of waste generated in households.

2. Identify ways of reducing household waste.
   a) Describe wasteful packaging and consumption and how to avoid it.
   b) Identify disposables and what the resuable substitutes are.

3. Explain why it is desirable to reduce waste.

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CONCEPT: RE-USE, RECYCLING PLAN #9

GRADE LEVEL: 7-9 SUBJECT AREAS: Social Studies

PROBLEM:
Which materials from household waste can be re-used or recycled and how can this be done?

ATTITUDE TO BE DEVELOPED IN STUDENTS:
Most materials we use can be used again, either as is or as raw materials for making new products. We ought to re-use and recycle wastes to conserve energy and resources.

PROCESS:
1. Distribute copies of the "Trash Table" from previous lesson plans, one week in advance of unit's start, with brief explanation.

2. Use the charts as a source of information to discuss the following questions: (constructive guesswork)
   a) Which specific waste materials could be easily re-used?
   b) Which specific waste materials could be re-used less easily?
   c) Which specific waste materials could not be re-used?
   d) Which materials originated from renewable resources?
   e) Which materials originated from non-renewable resources?
   f) As non-renewable resources are consumed, what will be the results?

3. Assign students to contact stores, food distributors, local recyclers, junk dealers, Salvation Army and garbage collectors, to get their views and report to the rest of the class.

4. Have students write up a mock-scientific report on a new use for a specific waste material or have them report on the imaginative result of the loss of a non-renewable resource.

5. Discuss the meaning and methods of re-using and recycling materials.

TIME FRAME: One week to complete "Trash Table" and make outside contacts. Two to three days for discussion and writing.

MATERIALS: Copies of "Trash Table." Reference material on natural resources.

FOLLOW-UP QUESTIONS:
1. What things can students do in re-using and recycling household wastes?

2. How can groups of individuals become more effective in waste re-use and recycling?

3. In what ways is waste a political, economic and social issue?

RESOURCES/REFERENCES:
Local Recycling Center (call Recycling Switchboard, 229-5555).
Social Studies and Science texts which deal with natural resources.

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"A Primer on Solid Wastes," Mobil Oil, 1975.
"Solid Waste - It Won't Go Away," League of Women Voters of the U.S., 1971.
"Recycling Fact Sheets," and "How to Recycle: A Guide to Saving and Sorting." Recycling Information Office of the Department of Environmental Quality, 1234 S.W. Morrison, Portland, Oregon 97205.
FILMS:
"Recycling Waste." 11 min., Oregon Division of Continuing Education, 1633 S.W. Park Ave., Portland Oregon 97207.
"Recycling In Action" 14 min., 1973, Film Fair Communications, 10900 Ventura Blvd., Studio City, California 90038.

COMPETENCIES/SKILLS:

1. Identify specific examples of household wastes, and specific methods of re-using and recycling this waste.

2. Tell how to put into personal action the methods identified.

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CONCEPT: REUSE, RECYCLING PLAN #10

GRADE LEVEL: 7-9 SUBJECT AREAS: Science Home Economics, Social Studies

PROBLEM:
How can students be made to realize that containers have life cycles?

ATTITUDE TO BE DEVELOPED IN STUDENTS:
That refuse should be considered a resource not a liability.

PROCESS:
1. Have students purchase an item of food or drink or a newspaper from the store and personally eat the product (if edible) and recycle the container.

2. On a collage or chart, etc., trace the "path" of the product from recycling center to manufacturer (back to food processor, to grocery store, to field, to seed, etc.)

3. Have student follow the path (directly or indirectly) for as far as possible.

4. Have the student write, draw, photograph or otherwise record their own personal experiences in a life cycle, closed loop format.

5. Have student conduct interviews at various stages of the processing. Do people like their jobs, etc? What materials are actually recycled, and where do they "return?"

TIME FRAME: One week for in-class and out-of-class activities.

MATERIALS: A food container with food in it, or a newspaper. Camera and/or drawing materials.

FOLLOW-UP QUESTIONS:
1. How do people see containers differently after seeing the processes they go through?

2. What elements are common to the "life" of all containers?

3. Why do people who actually process containers see them differently than consumers?

RESOURCES/REFERENCES:
Local Recycling Center, local manufacturers of recycled products. Reprinted from "Energy, Food and You," an interdisciplinary curriculum guide for secondary schools, Washington State Office of Public Instruction, Office of Environmental Education, Olympia, Washington.

COMPETENCIES/SKILLS:
1. Identify the specific cycle of a given waste product.

2. Distinguish the point at which waste items become valuable.

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CONCEPT: RECYCLING PLAN #11

GRADE LEVEL: 7-12 SUBJECT AREAS: Science, Math, Social Studies

PROBLEM:
What effect does recycling waste have on energy conservation, resources and economics?

ATTITUDE TO BE DEVELOPED IN STUDENTS:
Recycling reduces energy use, generates income and conserves natural resources.

PROCESS:
1. Ask each student to weigh their home garbage on a scale (bathroom type) each day for a week. Have the results marked on a chart, so the class can see how much garbage each student's family is collecting.

2. Next, have each student separate the garbage into the following categories over one weekend: wastepaper, newspaper, glass, metal, plastic and organic matter. Then have each student weigh each category and record what percent of the waste is related to the food system.

3. Then have each student research one of the above categories of garbage for the amount of energy it represents in kWh. Each student will report the results to the class.

4. Next, discuss alternatives to generating so much garbage: recycling, reuse of containers, returnable bottle legislation, less consumption of packaging, composting, etc.

5. Locate the nearest recycling center and find out what materials they will accept. Visit the center.

6. Set up a recycling center at home to cover these categories: newspaper, glass, returnable bottles, aluminum, "tin" cans, cardboard, paper. After the recycling is underway, have each student weigh the garbage for a week and compare the results with previous results.

7. Discuss the significance of recycling on a worldwide basis: How can recycling help to conserve the world's resources?

TIME FRAME: At least one week as a minimum

MATERIALS: Litter bags, transportation

FOLLOW-UP QUESTIONS:
1. What kinds of problems are found in recycling home garbage?

2. What effect does recycling information have on the solid waste flow?

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Plan #11 Continued

3. What effect does life style have on the amount and type of waste generated in the household?

RESOURCES/REFERENCES:

Local Recycling Center. Copies of "Environment" magazine. Portions reprinted from "Energy, Food and You," an interdisciplinary curriculum guide for secondary school, Washington State Office of Public Instruction, Office of Environmental Education, Olympia, Washington.

COMPETENCIES/SKILLS:

1. Become aware of the energy and material value of waste.
2. Recognize that there are alternatives for handling waste.
3. Measure amount of garbage produced in home and/or schoolroom before and after recycling practices are begun.

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CONCEPT: REUSE PLAN #12

GRADE LEVEL: 9-10 SUBJECT AREAS: Art, Home Economics

PROBLEM:
What is the energy savings in reusing, standard containers over using throw-away containers?

ATTITUDE TO BE DEVELOPED IN STUDENTS:
That using standardized, reusable containers saves in energy consumption.

PROCESS:
1. Compare energy subsidies represented by different containers. Show your results by drawing, producing a flow chart, or constructing a table. To do this, refer to such sources as Energy and Food for energy requirements of various containers.

2. Have each student choose a food item commonly used and determine if and/or where it could be purchased in a reusable container.

3. Using information gained in #1 and #2, design an exhibit and place it in a prominent place in the community.

4. Write a letter to a public official stating your findings and concerns.

TIME FRAME: Three to four days

MATERIALS: Poster board and markers

FOLLOW-UP QUESTIONS:
1. Why are some items available in both reusable and non-reusable containers?

2. What effect does public opinion have on use of energy-efficient containers?

RESOURCES/REFERENCES:
Hannon, B.H., "Bottles, Can, Energy" Environment Magazine, March 1972
Fritsch et al., Energy and Food, Center for Science in the Public Interest, Washington D.C.

COMPETENCIES/SKILLS:
1. Compare energy subsidies consumed by containers for production, marketing, use, return or reuse, disposal or recycling.

2. Identify containers representing the least energy subsidy.

3. Demonstrate awareness by designing exhibit and/or writing of findings to a public official.

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CONCEPT: REDUCTION PLAN #13

GRADE LEVEL: 9-12 SUBJECT AREAS: Home Economics

PROBLEM:
Most packaging ends up as waste and consumes both energy and raw materials.

ATTITUDE TO BE DEVELOPED IN STUDENTS:
Understand that packaging is often wasteful, consumes energy and can be greatly reduced by producer and consumer.

PROCESS:

1. Ask students to evaluate the following statements from two separate EPA reports, and then to measure the assumptions against their own attitudes:

   a) "The increase in packaging is attributed in large part to the increasing number of women in the work force and increased affluence, which it is expected should increase the demand for packaging which will save housewives time, especially in food preparation and cleanup. This can only be countered by greater education and concern about the impacts on the environment, as reflected in consumer purchase decision."

   b) "The homemaker rejects containers that are difficult to open or to reseal adequately. She wants a package that will fit her refrigerator or cabinet shelves. She dislikes breakable containers in the bathroom. She does not want to return deposit-type containers. She likes pressurized cans. She is an inveterate collector of jelly jars that she can use as drinking items."

2. Ask students to bring to class examples of wasteful and efficient packaging, (e.g. oversized pens, individually wrapped portions, large economy size vs. small, glass vs. plastic, returnables vs. non-returnables, applicator containers, re-usable containers for canisters, storage, etc., aerosol vs. pump or other dispensers).

3. Have students write letters encouraging retailers to carry returnables and recyclables. (e.g. glass milk containers). Write to legislators urging container standardization legislation which would make possible an expanded system of returnable, reusable, containers. Such a system would result in savings of materials and energy.

4. Organize a consumer's advisory committee for a local supermarket, to recommend packaging changes.

5. Have the class write to packaging companies urging them to use recycled materials.

TIME FRAME: At least one week

MATERIALS: None

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Plan #13 Continued

FOLLOW-UP QUESTIONS:

1. Why is packaging a social as well as an environmental issue?

2. In which areas is extra packaging necessary?

3. What can individuals do to reduce unnecessary packaging?

REFERENCES/RESOURCES:

1. 11-4-76 Eugene Register-Guard reprint of Los Angeles Times Article.
2. THE ROLE OF PACKAGING IN SOLID WASTE MANAGEMENT - 1966 to 1976 U.S. Environmental Protection Agency, 1971. Condensation (SW-5c.2)
3. PACKAGING AND SOLID WASTE MANAGEMENT, National Institute of Packaging, Handling and Logistic Engineers, Arlington, VA November 19, 1970 by Hugh H. Connolly. Environmental Health Service, DHEW.
4. AN EVALUATION OF THE EFFECTIVENESS AND COSTS OF REGULATORY AND FISCAL POLICY INSTRUMENTS ON PRODUCT PACKAGING, final report (SW-74c) U.S. EPA, 1974.
5. REDUCE, 1975 League of Women Voters Education Fund, researched and written by Diana Wahl.

Note: This lesson plan is followed by this background information as an integral part of the lesson.

THE SCOPE OF THE PROBLEM:

Each year Americans discard a scandalously enormous amount of solid waste, much of it waste only in the sense that materials capable of being productively reused are instead permitted to be needlessly lost. The latest tally compiled by a U.S. House of Representatives subcommittee: Each years Americans toss on the trash heap 17 billion cans, 38 billion bottles and jars, 4 million tons of plastic, 35 million tons of paper. 1) The total weight of packaging used by each of us between 1958 and 1971 increased by 44% from 404 lbs. each in 1958, to 525 lbs. in 1971 and 667 lbs. in 1976. 2) The cost of all packaging as a percent of the cost of a consumer product doubled between 1958-75. 3) In 1970, only 10% of packaging materials were being returned for reuse or reprocessing. The remaining 50 million tons which were discarded cost the nation over $450 million, reaching about $600 million in 1976.

THE TRADE OFFS:

Packaging can provide consumers a variety of services, such as protecting the product and its quality, pre-unitizing products, communicating information relevant to package content and product use. Convenience foods may save customers money and/or time. Centralized processing where water is removed and the inedible portions of products discarded reduces bulk, weight, perishability and marketing costs.

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Frozen concentrate orange juice in a composite can, frozen or canned peas and lima beans and instant coffee in a jar, for example, cost consumers about ½ of what their fresh counterparts cost. Most convenience foods, however, cost more than home-prepared counterparts, but save consumers time in preparation, e.g. baked goods, frozen foods, canned foods, mixes.

In many cases the convenience incorporated into products is a function of packaging, e.g. lotion dispensers; direct-use packages such as a shoe polish container with a zip-top lid, applicator and polishing cloth; pre-unitized packages such as single-portion breakfast cereals; and aerosols, such as rug shampoo with integral brush.

The packaging industry claims that convenience foods and packages are preferred because they diminish generation of solid waste (orange peels, corn cobs, etc.). One New York City industry claims that "sanitary frozen food packaging" eliminates 600 million lbs. of packaging. But these wastes are not eliminated, only relocated to the factory. The former head of NYC's EPA, Jerome Kretchmer, once remarked at Senate hearings, "I will take a thousand banana stalks for every thousand plastic trays on an even basis, one for one, any day you want to give them." He pointed out that food wastes, be they banana peels or fish heads, decompose in the land, and even add nutrients to the soil, while the plastic trays do not degrade and therefore require another form of disposal.

Other factors contributing to increased packaging: the vastly expanded choice in materials provided the package designer by the advent of plastics and other new materials; product protection and containerization; sanitation; communication; dispensing; unitizing; prevention of pilferage; reduction of the need for sales clerks with individually packages, preweighed goods; innovative, elaborate packaging as a marketing device.

RECOMMENDED LIFESTYLE CHANGES:

1) Buy items in bulk. A 3-oz. tube of toothpaste requires 50% more packaging per ounce than the 7-oz. size.

2) Re-use sacks. Wash out plastic sacks, keep with paper sacks to bring to the store when you make purchases. Durable shopping bags, string bags, knapsacks can serve as alternatives to paper bags.

3) Shop at stores which offer bulk sales, bring your own containers. Visit a grocery which offers nearly everything in bulk, from candy to cookies to beans to flour - unwrapped produce, meat. Many co-ops offering bulk foods would also make good field trips.

4) Buy items made from recycled materials.

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5) If you are dissatisfied with a product, write the manufacturer and send a copy to: Chief Counsel for the Consumer Protection Division, State of Oregon, 1133 S.W. Market, Portland, OR 97201.

6) Consider recyclability of containers. The current recycling situation in Oregon results in the following ranking, from most to least recyclable materials: 1) glass 2) aluminum 3) bi-metal cans 5) plastics. Since plastics are not being recycled much, they should be avoided whenever possible.

SUGGESTIONS FROM 1977 FAMILY ENERGY WATCH CALENDAR:

The buying habits of individual citizens affect industry much more than governmental regulation. The consumer has several tools to alter industry attitudes. Boycotting and banning of products has been used for many years, but preferential buying of products stimulates competition and development of those products without governmental intervention.

1) Let manufacturers and distributors know that you are willing to buy products made from recycled materials.

2) When products come on the market that are made from recycled or reused material, buy them and encourage others to buy them.

3) Cut down on items that are overpackaged by buying in bulk whenever possible, transfer to smaller containers at home if you wish. Avoid individually wrapped slices of cheese and prepackaged fruits and vegetables.

4) Avoid products packaged in polyvinylchloride containers (clear, semi-rigid glass-like containers which frequently hold shampoo, hand lotion, mouthwash and cooking oil.) These petroleum derivatives give off poisonous fumes when incinerated.

5) Avoid prepackaged and precooked foods. Cooking from scratch wastes less packaging, will probably cost you less and be more nutritious.

INTERESTING FACTS:

One of every three sacks that we bring home from the grocery store is packaging.

Eight percent of your food dollar is spent on packaging - $9.4 billion in 1973.

The food industry is the largest user of packaging materials - about 43%. 36% of the cost of baby food is for the containers; 12.7% of the cost of toilet articles is packaging; 10.2% of cookies and crackers; 8.9% of soaps and detergents; 9.9% of polishes and cleaners.

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Plan #13 Continued

Containers and packaging make up 3½ of every 10 tons in the solid waste stream (47 million tons).

The use of paper plates is growing 4 times faster than the population. The use of packaging in general is growing 3 times as fast as the population. In 1971 one of the largest fast food chains consumed 174 million lbs. of paper, requiring a sustained yield of 315 square miles of forest.

Food consumption in the U.S. increased only 2.3% by weight per capita between 1963 and 1971, while the packaging weight for that food rose 33.3% per capita. Between 1958 and 1970, per capita consumption of fresh produce dropped by 11% but packaging to deliver it increased by 38%. Milk consumption dropped by 23% capita while its packaging increased by 26%. Cereals dropped 6% while packaging was up 12.5%. From 1959-1969 the per capita consumption of beverages rose 29% while the packaging rose 164%.

A glass beverage container used 10 times, consumes less than 1/3 of the energy needed to make 10 non-returnable bottles.

If we had a national mandatory deposit law, we could save the equivalent of twelve 1,000 megawatt nuclear power plant each year.

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CONCEPT: REDUCTION PLAN #14

GRADE LEVEL: 10-12 SUBJECT AREAS: Social Studies, Home Economics

PROBLEM:
That trade-offs are involved in the consumption of resources through packaging.

ATTITUDE TO BE DEVELOPED IN STUDENTS:
Become aware of the extent that the fast food industry contributes to overpackaging.

PROCESS:

1. Divide the class into small groups. Each group will survey a local fast-food restaurant to find out how much paper it uses in a given period of time, such as a week or a month. Before beginning the survey, students should make up a questionnaire to be used when they interview the restaurant manager. Suggested questions are:

   A. What items made of paper does your establishment use?

   B. How many of each item do you use per (insert time period)?

   C. What companies supply these paper items?

   D. Why do you use paper packaging? (Answers might relate to cost, convenience, health codes, etc.)

   E. Do you think you are overpackaging your products? (Remember you want to keep the restaurant manager friendly, so be careful how students phrase this question).

   F. What percentage of the total cost of your product does the packaging represent?

   G. How much do your employees make per hour?

   H. Where and how do you dispose of your restaurant's solid waste (e.g. landfill, incinerate, recycle, etc.)?

2. When students have completed their interviews and tabulated their data, explore some of the following questions:

   A. What were the principal reasons given for the use of paper packaging?

   B. Are any of the paper items used by the fast-food outlets produced locally? If so, how many jobs are dependent upon sale of these products? (Don't forget printing, transportation, manufacturing of machines for printing, making paper, etc.)

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C. What alternatives to paper packaging are available to the restaurant owners? What is the environment and economic cost of these alternatives?

D. How would the alternatives affect the cost and convenience of take-out food? What price do we pay for convenience and in your opinion, is the convenience worth the price?

E. Would you be willing to accept more expensive food if the higher price resulted in less energy and resource consumption?

TIME FRAME: At least one week

MATERIALS: Paper for questionnaire, transportation

FOLLOW-UP QUESTIONS:

1. If fast-food restaurants decreased or eliminated paper packaging who would lose their jobs? Would other jobs compare in pay to the jobs lost in the paper mills?

2. If our population continues to grow within a finite resource base, which type of jobs would increase faster: the service-oriented, such as television repairmen and restaurant workers, or the resource extraction and process-oriented, such as paper mill workers and printers? Why?

3. What alternatives do paper mill employees, printers, cup manufacturers and other workers have if they are laid off? Could they be retrained for other jobs?

RESOURCES/REFERENCES:

Portions of this lesson plan were taken from Project Learning Tree.

COMPETENCIES/SKILLS:

1. Become aware of the role fast-food restaurants have on solid waste problem.

2. Recognize the unique problems associated with waste from fast-food restaurants.

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CONCEPT: REDUCTION PLAN #15

GRADE LEVEL: 8-12 SUBJECT AREAS: Environmental Education

PROBLEM:
That personal alternatives exist in our consumption habits, which would affect reduction of resources.

ATTITUDE TO BE DEVELOPED IN STUDENTS:
Understand that altering our patterns of resource use can conserve energy and resources.

PROCESS:
1. Ask your students to list the renewable and non-renewable resources they have used or consumed in the past 24 hours and identify each as a) essential for survival b) necessary for maintenance of their present life-style or c) a luxury.

2. Students then should propose alternatives for each item listed in categories two and three which they believe are inefficient or wasteful.

3. Have the class compile a master list of the resources used and the proposed alternatives. Discuss these questions:

   a) Are any items listed in the "essential" category really not essential? What is your criteria for evaluating an item's necessity?

   b) Are any items listed in the second category really luxuries? On what basis do you judge an item a luxury?

   c) What would be the environmental and economic impact of your alternatives? Would they increase the use of renewable resources? (For instance, switching from aluminum foil to cellophane food wrap would accomplish this.) Or would they increase the use of nonrenewable resources? (Switching from paper cups to plastic cups would have this effect.) Would they increase the use of energy?

   d) Look at the list of luxury items. Which of these could you give up without a major change in your lifestyle?

4. Have the students make a list, beginning with the easiest to give up and ending with the most difficult. Could they give up the top three items on this list for a day? A week? A month? Do it.

TIME FRAME: Two to three days

MATERIALS: None

FOLLOW-UP QUESTIONS:
1. Can we enjoy the present life-style and still decrease resource use? How?

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Plan #15 Continued

2. What happens to our awareness of resource use when we make the lists?

REFERENCES:

Portions of this lesson plan were taken from Project Learning Tree.

COMPETENCIES/SKILLS:

1. Altering life-styles to reduce consumption of resources.
2. Recognizing that alternatives exist for most consumer patterns.

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CONCEPT: REDUCTION PLAN #16

GRADE LEVEL: 10-12 SUBJECT AREAS: Math, Science

PROBLEM:
How much solid waste is generated by the lunch program in the school?

ATTITUDE TO BE DEVELOPED:
That the volume of solid waste in the school is significant and that school lunch programs are a major contributor.

PROCESS:
1. Have students save all lunch trash used by each, exclusive of food scraps.

2. Have students bring the waste to class and weigh it.

3. Have them chart the various items by weight or volume (ex. paper, plastic, wax cups, bottles, cans).

4. If desired, the procedure can be repeated for several days and the increase or decrease graphed accordingly.

5. Based on classroom amount per person, have students determine how much waste is generated in the school.

6. Invite a representative from the school kitchen to talk to the class about lunch generated waste.

TIME FRAME: Minimum is two days; suggested is one week, though only part of period need be used.

MATERIALS: Scale. Small car litter bags for each student. Pre-weighed container for weighing collected items. Large piece of newsprint or drawing paper for computing results.

FOLLOW-UP QUESTIONS:
1. Does the school lunch program generate more waste than the "brown-baggers?"

2. How is lunch waste associated with seasonal change?

3. How can school lunch waste be reduced? What kind of planning would be necessary?

4. What happens to the waste after it leaves the cafeteria?

GENERAL COMMENTS:
It is essential to inform people in charge of kitchen and custodial areas of the lesson before you start and get permission of principal. Stress to kids that food scraps should be removed for obvious reasons.

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Plan #16 Continued

RESOURCES/REFERENCES:

"In the Bag" (film) National Medical A.V. Center, 1969-M-2091-X, free. Cook and/or custodian in school. "Reduce," League of Women Voters of the U.S. pamphlet, 1975. Local recycling center and/or Stop Oregon Litter & Vandalism pamphlets.

COMPETENCIES/SKILLS:

1. Demonstrate or explain ways in which waste reduction can take place.

2. Identify unnecessary school lunch waste.

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CONCEPT: RECYCLING PLAN #17

GRADE LEVEL: 7-12 SUBJECT AREAS: Science, Industrial Arts (shop)

PROBLEM:
How can organic waste be removed from the solid waste stream and what factors must be considered in recycling it?

ATTITUDE TO BE DEVELOPED IN STUDENTS:
That recycled organic wastes complete natural cycles and improve soil structure and fertility.

PROCESS:

1. Read about the alternatives for construction of compost bins or containers and choose the methods which are within your time and budget.

2. Using school garbage (without bones, meat, grease), grass clippings, manure, weeds, hay, sawdust, coffee wastes, etc., start five small experimental compost piles on the ground.

3. Try to keep compost piles about one cubic yard to begin with, or if necessary, use five-gallon buckets with holes drilled in the sides.

4. Use each of the five conditions below for each of the five compost piles:

   A. Low in nitrogen
      - no manure or garbage that is high in nitrogen
      - moisten, don't soak
      - turn over regularly, every 3-4 days at first, then once a week
      - include a mixture of ingredients: garbage, clippings, leaves, weeds, etc.

   B. Not enough moisture
      - include manure and contents which are high in nitrogen
      - turn regularly
      - have a good mixture of ingredients
      - don't water at all and make an effort not to add garbage that has a lot of moisture in it

   C. No air circulation
      - include nitrogenous materials
      - have a good mixture of ingredients
      - keep moist
      - do not stir or turn

   D. Too much of a single ingredient
      - put all leaves, or grass clippings in this pile
      - moisten
      - stir regularly

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E. Ideal compost pile
- include nitrogenous material (manure, blood meal, are good sources)
- keep moist
- stire regularly
- include a good mix of ingredients which are layered

5. Keep a daily record of the temperature of each pile.

6. Discuss the results after a few weeks. What are the essential ingredients of a good compost system?

TIME FRAME: One week to put program into effect, then periodic checking for 3-5 weeks.

MATERIALS:
Outside space for piles, gardening equipment, thermometer, supply of ingredients.

FOLLOW-UP QUESTIONS:
1. How is the compost pile like the nitrogen cycle and other natural cycles in our biosphere?

2. Where does composting occur naturally?

3. What is the result of not recycling vital chemicals to their origins?

GENERAL COMMENTS:
This project requires space, time and follow through by students beyond ordinary classroom activities. Cooperation of kitchen/custodial staff and school administration is mandatory! Be advised that compost piles are not odor-free.

RESOURCES/REFERENCES:
Rodale, Robert (ed.) The Basic Book of Organic Gardening. Ballantine Books, p. 61-68.
Organic Gardening and Farming, "Laboratory Experiments in Composting Teaches Duke University Engineering Students," July, 1973, p.4.
Organic Gardening and Farming, "The Compost Heap that Grew Into the 14-day Method," April, 1975.
Ecology of Compost, State University of New York College of Science and Forestry. Schatz, A.&V., "Teaching Science with Garbage" (An Interdisciplinary Approach to Environmental Education from the Points of View of Science, Mathematics and Social Studies) Rodale Press, Emmaus, PA 18049.
Reprinted from "Energy, Food and You," an interdisciplinary curriculum guide for secondary schools, Washington State Office of Public Instruction, Office of Environmental Education, Olympia, WA.

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Plan #17 Continued

COMPETENCIES/SKILLS:

1. Understand the basic principles involved in building a good compost pile.

2. Be able to operate a workable compost pile.

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CONCEPT: REDUCTION, REUSE, RECYCLING PLAN #18

GRADE LEVEL: 10-12 SUBJECT AREAS: Language Arts, Literature

PROBLEM:
What ideas result when imagination and creativity are applied to reduction, recovery and reuse of natural resources and what happens when the opposite is true?

ATTITUDE TO BE DEVELOPED IN STUDENTS:
That literature is an accurate reflection of human conservation as well as the misuse of natural resources.

PROCESS:
1. Select a small group of five students to read and discuss selections from novel, Dune by Frank Herbert.

2. Small group discussion - problem solving approach applied to the idea of bringing about sound environmental change based on the actions of protagonist (Paul Atriedes).

3. Individual projects - have each student think of an innovative technique for the recovery and recycling of valuable resources like air and waste using information about the setting (the Planet Arrakis).

4. Simulation game - have the group spend one period assuming roles of major characters from Dune. Each person should be given several problems and must solve each in turn, limiting reactions to what they would expect their character to do. (Ex. of characters: Paul Atreides, Dr. Yueh, Bene Gesserit, Baron Harkonnen, Lady Jessica and Rev. Mother Gaius.)

TIME FRAME: Open ended; minimum time would be one week, with probable maximum time about five weeks, depending on the amount of reading assigned.

MATERIALS: Text Dune, Frank Herbert, Ace Books, 1965, $1.25. Cliff's Notes, David Allen, $1.50 (for reference).

FOLLOW-UP QUESTIONS:
1. What does the fictional Dune have in common with Earth?

2. How could Earth evolve into a situation like that in Dune?

3. What are some examples of similar situations found on Earth?

GENERAL COMMENTS:
Rather than read the entire novel suggested, assignments could be (Book I, Appendix I, Glossary of Terms). General literature studies could handle these comfortably. Average ability or better students could cope with the terminology. Provide reading time in class.

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Plan #18 Continued

REFERENCES/RESOURCES:

"Make Room, Make Room," Harry Harrison.
"The Law," Robert Coates.
"Dune Messiah," Frank Herbert

COMPETENCIES/SKILLS:

Identify the three concepts of reduction, reuse and recycling. Show how imagination and creativity can be applied to these concepts.

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CONCEPT: REDUCE, REUSE, RECYCLING PLAN #19

GRADE LEVEL: 10-12 SUBJECT AREAS: Language Arts, Literature

PROBLEM:
What aspects of destructive human behavior are the result of culture, background and tradition?

ATTITUDE TO BE DEVELOPED IN STUDENTS:
How fiction illustrates and reflects the problems resulting from human interaction with the environment.

PROCESS:
1. Students will read assigned short story.

2. Students will prepare a list of environmentally unsound behavior found in story.

3. Discussion will follow each student's reading of their list, considering such things as the motives involved, the question of responsibility and the possible kinds of alternatives.

4. A "wrap-up" discussion will seek to identify the following ideas:
   a) Humans do not own the earth (or any other planet).
   b) Human behavior is often destructive.
   c) The environment is in fragile balance (more so on other planets).
   d) There are reasonable alternatives to "traditional human" interaction with environment.

TIME FRAME: Suggested around two days (follow-up discussion or writing assignment may take a third day).

MATERIALS: The Martian Chronicles, Ray Bradbury (recommend one or more of the following stories: "The Third Expedition," "Usher II", "Green Morning" or "The Taxpayer").

FOLLOW-UP QUESTIONS:
1. Is the Martian environment much different than Earth?

2. Will human interaction with environment in the future really be like the science fiction writers suggest?

3. Can humans reuse an alien environment?

GENERAL COMMENTS:
The teacher needs to point out how human behavior is the basic part of any environmental problem and emphasize the need for social concern in solving those problems. These are easily read stories and will work successfully for any reading level.

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Plan #19 Continued

RESOURCES/REFERENCES:

Life Magazine Reprint - "Life in the Future"
"Science Fiction in the Classroom" Hal Borland
"Soylent Green" (film)
"Eco-Fiction" John Stodler, (ed.), Washington Square Press, 1971

COMPETENCIES/SKILLS:

1. Identify environmentally unsound human behavior, place each in order of importance and offer alternatives for each. This could be done in a test, essay or in small group discussions.

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CONCEPT: RECYCLING PLAN #20

GRADE LEVEL: 10-12 SUBJECT AREAS: Social Studies, Science, Math

PROBLEM:
Which types of solid waste offer the greatest potential as income-generating material?

ATTITUDE TO BE DEVELOPED IN STUDENTS:
Economic potentials exist in the recycling of solid waste.

PROCESS:
1. Have students save recyclable garbage for one week and sort it by type (newspaper, other paper, tin, aluminum and glass).

2. Have them collect the following data:
   a) Which type weighed the most? Which least?
   b) What percentage of total was each type?

3. Contact a local recycling center or the Recycling Switchboard of the D.E.Q. to obtain current values of these items.

4. Determine the value of each student's materials.

5. Actually market the materials if possible and practical.

TIME FRAME: One week for collection and one week for follow-up.

MATERIALS: Large litter bags, transportation for recyclables.

FOLLOW-UP QUESTIONS:
1. If students were going into the recycling business, which items would they handle? Why?

2. How long would it take to accumulate enough of each item to market it successfully?

3. What related problems would have to be solved in recycling as a business?

GENERAL COMMENTS:
Much of the collection and marketing of the collected items would have to be done outside of class. An alternative would be to donate the material to a recycling center.

RESOURCES/REFERENCES:
Various bulletins from Recycling Switchboard of the D.E.Q. Portions of this plan were taken from "Energy and Man's Environment," 0224 S.W. Hamilton, Suite 301, Portland, OR 97201.

COMPETENCIES/SKILLS:
1. Recognize the economic significance of solid waste.

2. Identify types of solid waste having value when recycled.

3. Point out common factors affecting profit/loss in recycling businesses.

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REDUCE, REUSE, RECYCLE...A BRIEF AFTERWORD

The Throw-away Society

Over the years seemingly unlimited virgin raw materials, an ever-growing technology, new marketing techniques and an affluent public placing emphasis on convenience over thrift, have increased the quantity and complexity of the vast array of products pouring into our homes, businesses, and institutions. Each product leaves behind a stream of wastes (called residuals) as it is processed from raw materials of field, forest, mine or sea through each industrial and commercial step until it reaches the hands of the final consumer. All too often that consumer uses it once or for a short duration and then it, too, becomes waste.

This "disposable ethic" has led to a staggering solid waste problem...staggering in the total amount of garbage...staggering in the cost of collecting and disposal...staggering in the consumption of the earth's resources...staggering in the damage wreaked upon the environment at every step in this wasteful lifestyle. The scarring of the landscape with mining and cutting and dumping, the fouling of the waters with silt, pollutants and waste, the filling of the air we breathe with particles and unseen poisons...all this has led us to the point of having so much waste and so little place to put it that we are forced to seek solutions.

These solutions must necessarily change habits and attitudes from our traditional ways of using and wasting materials and energy. We are slowly beginning to understand that permanent solutions must come within the natural cycles of conservation of matter and energy that have always existed on this finite planet. Nature has always been in the recycling business, continually recycling all matter on earth, constantly changing its form and using and re-using it in never-ending cycles. Thus we must realize finally that there is "NO SUCH PLACE AS AWAY." We simply cannot "throw it away" on this planet. Whether we bury it, burn it, dump it in the sea, river or down the drain, it never gets lost. It just changes into other forms and remains in the environment forever.

Two Approaches

The growing awareness of real and potential raw material shortages, and interest in new energy sources as depletion of traditional ones becomes acute, has led to stepped up activity in recycling of waste materials. Most recently has come the realization that we must also seek to reduce the amount of products we make in the first place, and to consume less materials and energy in the products we do make. These twin approaches (source reduction and resource recovery) must proceed together, as it is increasingly apparent that neither by itself will succeed in the goals of resource conservation, environmental protection and solid waste reduction.

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Salvaging used materials from the waste stream has been an occupation since ancient times and has existed as a lucrative secondary materials industry in this country for decades. Until very recently, however, most recycling has been accomplished within the industrial structure...i.e. "home scrap" that never leaves the mill, or "industrial scrap" that is returned directly to the mill from manufacturing plants. These materials are residual wastes left in the wake of producing a consumer item from raw material to finished product.

These residuals are usually of nearly the same quality as the primary product and are thus easily recycled. However, the only part of the waste stream that most people deal with and see is the mixed urban wastes discarded by the final consumer which usually end up as solid waste on the dump (post-consumer scrap or wastes). These are more difficult and expensive to recover and recycle, but it is to these we must turn our attention when considering solutions to the mounting solid waste problem.

Only now is our country becoming aware that another, fundamentally more conservative because more earth-saving, solution is to reduce the total amount of materials and energy consumed in product manufacturing in the first place (source reduction), which in turn reduces the amount of wastes generated in the second place. Through changes in national priorities, needs and attitudes, we must set manufacturing policies which reduce the amount of materials used per product and make each product more durable for longer life and reduce the total number of products we make and then throw away.

In 1973, the people of the United States generated 144.2 million tons of post-consumer wastes. (This does NOT include wastes from mining, agriculture and industrial processing, nor demolition and construction wastes, nor street sweepings and sewage sludge.) Of this only 9.4 million tons (7%) were recycled. Of the 134.8 million tons lost to reuse, over 60% were discarded consumer products:

1. Durable goods (major appliances, furniture, tires, etc.) 14.4 million tons or 11%.
2. Non-durable goods (newspapers and magazines, office papers, paper plates, towels, tissues, etc.) 24.2 million tons or 18%.
3. Packaging and containers (bottles, boxes, cans, wrappings, etc.) 47 million tons or 35%.

It becomes obvious that these wastes are the best targets for source reduction and increased recycling measures.

Source Reduction

In approaching source reduction, any mandatory measures represent a form of product control. Not all these measures come through government...some are decisions of industry facing material and energy shortages, but most of the impetus comes from government action or the threat thereof. Voluntary measures come through

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the actions of the public, making consumer purchasing choices and working as groups for changes in product use or design.

Some industry currently has reacted to energy and resource shortages and inflation by reducing the variety of products (e.g. less number of sizes of a container), or redesigning products to use less materials. This is projected to continue as shortages and prices continue to increase. Also design shifts are now becoming a requirement among designers and marketers, as resource use becomes high-priority consideration in the manufactureof a product.

Packaging control legislation has been introduced in 50 state legislatures since 1971. As of October 1974, three states (Oregon, Vermont, South Dakota) had passed laws regulating items. Appealing to both resource conservation and solid waste management needs, citizen and public interest groups consistently call for national efforts to decrease packaging, conserve resources, and reduce the generation of wastes.

Recycling

When considering the general business of recycling, we must understand certain facts: 1) Nothing is recycled until it is used as a raw material to make a product. 2) When volunteers collect glass, cans, paper, etc., and prepare them for collections, this is only the first step in a complex process. They must have a market for their materials within a reasonable transporting distance. 3) Demand for recycled waste materials must come from industry, who depend on these either exclusively or to supplement virgin, raw materials and home scrap. Demand, not supply, is the key and/or the obstacle to increased recycling.

Demand for waste materials is affected by things. The purity of the material is a vital factor. In mixed urban wastes, desirable materials are mixed with undesirables, which leads to problems of separation. Segregating various waste materials at their source, (source separation), before they become mixed together has proven to be the most successful and prominent means of recycling post-consumer wastes to date. Technology for resource recovery from mixed wastes is still in the development stage, and the fact that these plants will depend on high volume of wastes to justify their operating costs does not square with the need to reduce the amount of wastes generated initially. Thus recycling which encourages households and businesses to separate their materials as they are discarded must be increased.

In 1973 only 16% of the post-consumer waste paper was recycled. This amount could easily be doubled by expanding source separation of paper. By September 1974 there were approximately 134 programs for separation of newspaper by homeowners for regular collection.

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Source separation of corrugated containers and office paper grew rapidly in 1973. Since the beginning of that year over 200 office paper separation programs have been started.

Less than 2% of the steel scrap (excluding autos), about 3% of the post-consumer glass and about 3.5% of the aluminum was recovered from the waste stream in 1973. This was primarily done through volunteer collection centers with source-separated materials, as no technology for recovering glass and aluminum from mixed wastes has been demonstrated so far. Some 25 cities are currently magnetically separating ferrous metal from their shredded wastes.

Government and industry need to deal with current obstacles to recycling which include prices, taxes and shipping rates, all favoring virgin raw materials over salvaged materials. Present market pricing does not include environmental costs of harvesting, mining, drilling and lumbering activities, nor does it include the social, as well as the energy and environmental costs of processing and disposing of consumer products.

In order to encourage increased recycling, we have seen that demand must be increased for secondary materials. This is dependent upon material quality and price. We must work to overcome the competitive advantage enjoyed by virgin resources by some of the following proposals: levy new taxes to shift the price advantage; cut long-standing tax benefits, pushing up virgin material prices; subsidize secondary materials to lower their prices; eliminate shipping cost differentials; change government regulations through labeling requirements and procurement specifications. Then we must continue to encourage volunteer and business recycling through source separation to create the quality of material acceptable to industry.

Oregon's former governor, Tom McCall, has many times pointed out the evident need for public education in the field of environmental awareness. Oregon led the nation in waste reduction legislation with its "bottle bill" in 1971. In addition, legislative resolutions such as this one have put Oregon on record as promoting and encouraging recycling and reuse in state offices and the public schools.

Legislation is necessary and good, but education in our homes, industries, and schools is vital. Environmental education should not be a "new" subject, taught separately. All subjects should incorporate environmental implications and considerations and this should be part of the curriculum from kindergarten through 12th grade. The child needs to develop not only the basic learning skills, but become aware of the interaction of all life systems and his/her impact on them. He/she must learn that not only is everything connected to everything else, but that everything has a cost. Schools need to show by example and action that even one person can make a difference in reducing wastes we generate.

We need to thoroughly understand that habits, attitudes, even lifestyles must necessarily be affected by decisions and actions we take to change ourselves from "affluent abusers" to "thoughtful users."

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COUNTDOWN TO COLLISION (31 min. color) high school, adult
Environmental Protection Agency
Sponsor: medical association & physicians organizations in Wash. D.C.
This film showed all kinds of environmental problems caused by mankind, used a collage-like manner, raised stimulating questions and emphasized cause and effect relationships rather than focusing blame. Preview before using. "...marks the end of ecological innocence." "The price is involvement." During satellite shot of planet earth: "...and please try to keep your trash around your own seat."

THE ECOLOGY LADY (11 min. color) junior high and up
rent $15, purchase $150 Stuart Finley, Inc., Falls Church, VA 22041
The typical neighborhood recycling center has many problems. Dependence on volunteer labor, uncertain funding, finding markets, poorly prepared materials...all these were brought out in chatting with the person who runs the center at Tysons Corner, Va. She sounds tired, but is holding on. Might be best used where group moral is high enough that these things are taken as preparation rather than discouragement. Some value in showing what the whole operation looks like.

GARBAGE (10½ min. color) 1970 rent $4.00 I-C-E RMC, 1927 Main St. Green Bay, Wis. 54301 (Teachers in Portland Public Schools and Mult. Co. I.E.D. have copies available locally.) Junior high and up.
An attempt to offer a shocking glimpse of the seriousness of the garbage problem. Amounts of garbage are given a dramatic and effective presentation. Not much else to it.

THE GARBAGE EXPLOSION (16 min. color) 1970 rent $9.00 purchase $200. Encyclopedia Britanica Educ. Corp., 425 N. Michigan, Chicago, Ill. Junior high and up.
An uninspired survey-type film. Infinite scenes of scrapped autos, open dumps, litter, etc. develop the intensity of the problem. Then a series of disposal methods are explained: incineration, landfill, recycling, etc. Maybe better because shorter than some other films that pose the problem.

THE GREAT ALL AMERICAN TRASH CAN (13 min. color) 1971 - 4th grade up.
Commonwealth Film Distributors, 1440 S. State College Blvd., Bldg. 6-K, Anaheim, CA 98206 Sponsor: Glass Container Corp. Free loan.
An industry film is an industry film, i.e. you get a lot of propaganda. This one does seem a bit more informative than most, especially for groups not aware of recycling ideas. Begins with costs and amounts of garbage. Mentions recycling as a way to lighten that load. Then shows how glass can be recycled. Shows glasphalt, floor terrazzo, insulation, sound proofing, cinder blocks for building walls. Good info., but tiptoed past the idea of making glass back into containers. Best application might be in areas which are far enough from glass manufacturing to make shipping too costly.

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THE HOUSE THAT RECYCLING BUILT (9½ min. color) Production: Reynolds Metals Co. free loan: Joe Moffatt, Public Relations, Reynolds Metals Co., 1800 S.W. First St., Portland, OR 97201. 4th grade and up

One of the many promotional films done by the aluminum industry. This one at least has an interesting angle; they go through the complete construction of a modern home showing how each item is made from recycled materials and showing the installation. Uses recycled aluminum beams, glasphalt, paper-fi er insulation and roofing, cinder blocks and terrazzo floors using glass particles.

JUNKDUMP (15 min. color) 1972 Prod. Communico. rental $4.50 from I-C-E (address p.66) Mult. County I.E.D (note p.66) also ACI Films, Inc., 35 W. 45th, New York, N.Y. 10036. high school and up

A statement film indicting a consumer society by going through a day in the life of a couple who live in the dump (Everyman?). They wake up to the sounds of garbage trucks, go through the rituals of breakfast, going to work (in a junk car which doesn't actually move), a day at the junk "office", then return home with a flower (plastic, of course), and caressing the baby (a dirty, broken doll). Flashes from the tangled junk back to the same products on the market shelves. Ends effectively with the children's song "Hush, little baby, don't you cry, Daddy's gonna buy...buy...buy...Daddy's gonna tell you it doesn't matter." Preview before showing. This type of satire is a negative to some viewers; others feel it is a strong entertaining way to make this statement.

LET'S HELP RECYCLE (11 min. color) rental $8.00 through Oregon Division of Continuing Education, Film Library, P.O. Box 1491 or 1633 S.W. Park, Portland, OR 97207/:29.4890. 4th to 7th grades

Shows a group of school children going before the city council to report on recycling and to ask municipal consideration of a separate pick-up system. Shows preparation of materials for recycling. Encourages waste reduction. Flashes back and forth from kids making their reports to the scenes of what they've been doing. This style isn't the best, but would probably hold interest and motivate grade school children, as it pictures them logically confronting adults on "grown-up" territory.

NO DEPOSIT, NO RETURN (10 min. color) rental $7.75 Oregon Division of Continuing Education (address p.67) high school and up

Shows pollution problems on a planetary level. Presents the problems; no suggestion of solutions except perhaps the implication that we must care. Most previewers felt the film was disjointed and too artsy, but several felt it was aesthetically well done. Big flaw seemed to be the slow beginning. It could be more appropriately viewed as a population control, rather than recycling, film as emphasis is on numbers. The plays, create intensely sad overtones, but quips are thrown in: "Be wary of Los Angeles."

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POLLUTION IN PERSPECTIVE: SOLID WASTE (17 min. color) 1971, Prod. and Distribution: General Electric Co., rental $5.00 from I-C-E (address p.66) interested high school or older.

A filmed symposium presenting several perspectives and raising questions about how society should deal with solid waste. Brings up recycling and source reduction (consumer consciousness). Some good material, but presentation is dry. Too much footage of the symposium members talking to the camera. We must... "pay for the disposal at some point."

RECYCLING (EPA) (21 min. color) rental $5.00 from I-C-E (address p.66) also Stuart Finley, Inc., 3428 Mansfield Rd., Falls Church, VA 22041. Junior high and up.

Shows existing techniques for recovering materials from solid waste and equipment and systems being developed to recover more. Indicates how little recycling is actually being done. Does mention source reduction. Shorter version of "The Realities of Recycling."

THE REALITIES OF RECYCLING (38 min. color) 1971 EPA free loan: from Modern Talking Picture Service 2323 New Hyde Park Rd., New Hyde Park, N.Y. 11040. Junior high and up.

Solid waste is considered a resource, but the techniques of retrieval are basically big machine. Demonstrates that there is a market for paper, newsprint, tin and aluminum cans, glass, scrap cars and agricultural waste. Does show several examples of citizens voluntarily cooperating in recycling programs (newsprint in Madison; aluminum cans in San Diego). A good survey of many EPA solid waste projects. Stresses that government, industry and citizens must cooperate to make recycling effective. Though this film didn't get into the top ratings, most previewers felt that it is useful.

RECYCLING IN ACTION (14 min. color) 1973 purchase $185, rental $20. from Film Fair Communications, 10900 Ventura Blvd., Studio City, CA 91604. 6th grade and up.

Establishes need for recycling solid waste. Introduces a community recycling center, showing how items are prepared and processed. Shows processes of converting wastes into new materials: paper, aluminum, telephone cable, metals, glass, plastic (misleading). A reasonably competent school survey. Teacher needs to discuss.

Richmond Myrtle Cairns 2125 N.W. Flanders	Ted Hollingsworth 287-6439 2874 N.E. 22nd	5th grade

RECYCLING OUR RESOURCES (10 min. color) purchase $160, rental $20 from Oxford Films, 1136 N. Las Palmas Ave., Los Angeles, CA 90038. Also Mult. Co. I.E.D. available to teachers in that system. 3rd grade & up.

Received top recommendations from previewers. "This earth is our home"...and is dependent on cycles. "Man interferes with the

cycles." Discusses how recycling contributes to resource conservation. Shows retrieval of glass, metal and paper through hydropulping. Raises consciousness about patterns of waste: "reuse," "redesign," "do we need," "use more wisely," "if we waste, where will we get more?" Simply presented. Could be used for lower grades as well as general audiences.

RECYCLING WASTE (11 min. color) 1971 rental $7.75 from Oregon Division of Continuing Education (address p. 67) junior high and up.
Top recommendations from previewers. Emphasized the role of manufacturing in creating massive solid waste problems and admonishes them to help solve it by recycling and making less environmentally obnoxious products and packaging. Shows some of the processes for items being recycled. Good explanation of terms such as "biodegradable." Clear and concise. Asked good questions; ended with a reference to the necessity for further action and ideas. "Change the form from something that works against us to something that works for us."

THE SAN DIEGO EXPERIENCE (17 min. color) free loan from Modern Talking Pictures Service (address p. 68) Sponsor: Aluminum Co. of America Copyright date "not available." 3rd grade and up.
Propaganda account of Alcoa's "Yes We Can" recycling program in which citizens are paid for returning cans to distributors. Lots of interviews with officials saying "Fine, fine program," which seemed a waste of footage. Would imply that there's no need to change the society's throw-away attitude or greediness. Epitomized by the lengthy scene of the preparation of a banana split as a "reward."

SOLID WASTE & RECYCLING, Teacher's Manual 10 transparencies, 20-35 mm slides, $58.00 Education Modules, Inc.

THE SOILED FRONTIER (27 min. color) 1969. State of Oregon Environmental Report - rental $12.75 from Oregon Div. of Continuing Educ. (address p 67)
An interesting, well-made Oregon film showing air, water and solid waste pollution problems. Contrasts Oregon beauty with Oregon eyesores. Effective selection of detail for camera work and recognizable scenes give impact. Deals with auto exhausts, oil, tires, junk cars, litter and the bottle bill and estuary landfill. Asks the viewer to make a personal commitment to protecting the environment. Shows the importance of small acts and creates a positive attitude by showing successful clean-ups and improvements.

THINGS WORTH SAVING (12 min. color) free from producer: National Center for Resource Recovery, 1211 Connecticut Ave., N.W. Washington D.C. 20036. Junior high and up.
Solid waste is the third largest municipal expense, the film states and shows us some of the alternatives for what to do with it, stress going on the economic issues. It presents this

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kind of information fairly well, but doesn't get into individual involvement either in the problem or the film.

THE THIRD POLLUTION (23 min. color) 1966 purchase $225, rental $22.50 from Stuart Finley Inc., (address p. 68) or I-C-E (address p.66) or free from Multnomah County Library - 8th grade and up.

Good film for presenting problem areas. Shows improved methods of waste disposal in several cities. Also production of gas and charcoal from waste, difficulty in livestock waste disposal, mammoth salvage operation needed for 7 million autos annually. The perspective on recycling (only hinted at) is that it would be a superior method but not practical considering public apathy. Quips about the consumer: "If it can be appealingly packaged, man will buy it." Doesn't become an advocate of the possibilities shown. Most previewers considered it too long. Much big machinery.

A THOUSAND SUNS (9 min. color) $15 rental, $140 purchase from Gilbert Film Associates, but free from Mult. Co. Library. high school and up.

Though this film doesn't relate much information, the questions it raises regarding energy and our sets of values is distinctly applicable. "We are taught to consume. Taught to equate happiness with things...question is, how much more do we want...We can choose." Great range of reactions from previewers. Inspiring, motivating, vague, negative, not related to recycling, etc. So, it's best to preview it before using.

UNCLE SMILEY GOES RECYCLING (13 min. color) 1972 purchase $165, rental $15 from Learning Corp. of America, 711 5th Avenue, N.Y. 10022 and free to teachers in the system of Portland Public Schools and Multnomah Co. I.E.D. from their film depts. Kindergarten to 6th grade.

Entertaining, spirited and therefore possibly motivating. Children should understand the concept of recycling before viewing. A group of children come into Uncle Smiley's shop and persuade him to take them "recycling." They pick up various items in a pushcart and later transport them in a bright red antique car (which turns out to be a polluter). No narrative; the slapstick action is set to music, top recommendations from previewers.

USE IT, USE IT UP (26 min. color) 1975 purchase $320, rental $23 from University of California Extension Media Center, Berkeley, CA 94720. Junior high and up.

Hard-sell. Has good information, but could offend rather than persuade the uncommitted. Best used to energize the "believers." Begins by showing how discards from one creature or plant are always put to use by another. Until we get to mankind, that is. The contrast is drawn by Jane Jumbleall, a housewife who makes a trip to the supermarket purchasing food in elaborately excessive packaging. Later, in speedup sequences, the food is consumed and the packaging tossed out. You see the relative amounts of foo to containers. When they add up the bills, they

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see how expensive their habits are. Jane, now Mrs. Livingwell, then goes to the market buying beverages in returnable containers, fresh foods instead of canned or frozen, avoiding multiple packaging, etc. Amounts and types of energy used in making various items of packaging are described.

THE VILLAGE GREEN (15 min. color) 1974 - free from Solid Waste Materials Control Section, U.S. Environ. Prot. Agency, Cincinnati, Ohio 45268. Junior high and up.

Documents a successful and self-sustaining recycling center in New York City sponsored by the Environmental Action Coalition. Shows how concerned individuals can develop community support and overcome problems in recycling programs. Shows real people doing something together for a variety of personal reasons. "Conservation and recycling...no longer a good idea but an inevitability." Maybe government should be responsible, showing a need municipal leaders could not ignore.

MORE (3 min. color) rental $2.50 from I-C-E (address p.66) and free from Mult. Co. Library. 3rd grade and up.

A non-verbal animated film showing conspicuous consumption to abnormal proportions. The earth crumbles and collapses. Point cleverly made; doesn't seem overdone.

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GLOSSARY

Source of definitions: Environmental Protection Agency (EPA) and League of Women Voters (LWV)

SOURCE REDUCTION (or Waste Reduction) - Reduction in the generation of waste at its source, through a reduction in consumption of materials and energy by redesigning products or by otherwise changing societal patterns of consumption. (EPA)

SOLID WASTE - Unwanted or discarded materials with insufficient liquid content to be free flowing. (EPA)

RESOURCE RECOVERY - General term for variety of approaches for retrieving from solid wastes materials which still have useful physical or chemical properties after serving a specific purpose, and can, therefore, be reused or recycled for the same or other purpose. (EPA)

SALVAGE - A general term for reuse and recycling. (LWV)

REUSE - The multiple use of a product in its original form (e.g. using, washing, and refilling of a glass bottle). Different from recycling in that product is not reprocessed and refabricated but used in its original form. (EPA)

RECYCLING - Extracting materials from the solid waste stream and then utilizing them either in original or changed form. Most frequently, recycling is returning a material into the process by which it was first formed (e.g. waste paper into paper-making, crushed glass cullet into glass making, etc.) (LWV)

HOME SCRAP - residual material which never leaves the mill where it was made in the first place.

INDUSTRIAL SCRAP - Comes back to the mill from fabricating plants. Both these are of almost same quality as primary product and easily recycled.

POST-CONSUMER SCRAP OR WASTES - Those materials and products discarded by the final consumer, (not by raw-material producers and manufacturers) i.e. from homes, businesses, offices, schools, etc. (EPA)

SOURCE SEPARATION - The segregation of specific waste products at their point of discard for concentrated collection. (EPA)

MIXED WASTE RECOVERY - Solid wastes collected in mixed form and then processed, usually mechanically, to yield secondary materials or energy products. Includes a variety of technologies for separating and converting mixed refuse into useful materials. (EPA)

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